Electrical World

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The Attack on the Holding Company

THE necessity of publicity and of an informed public opinion is very apparent in the case of the holding company. Here is an instrumentality, possessing obvious advantages and capable of much good, damned because it is not understood or properly comprehended. Obviously the fault rests with the holding companies themselves, but it would ill become the electric light and power industry to play the part of the Levite and pass the attack by unnoticed. Much of the holding-company mess—and it is a mess—is attributable to the rapid growth of the electric light and power industry, the leaders deeming it more important, and rightly so, to expand facilities first and clean up corporate structures afterward. This situation will right itself in time. But the source of irritation lies in a different direction.

The electric light and power industry is having one of its unwilled but periodic attacks of interference by speculators—men who possess none of the spirit, recognize none of the traditions and are not part and parcel of the industry, but who are privileged to buy its stocks and bonds—and sometimes control—in the open market and who have exercised that right. These people have no mind to develop and distribute equitably the advantages of consolidation or of interconnections. Their interest is ended when they close their account with their broker and get out of the market. Those of them who reckon that they can get their money out of the market and still sit in the game are the worst troublemakers of the lot—that is to say, the groups who sell on plausible representation enough securities to insure themselves against loss (or more likely to make a good profit) and still keep control through voting stock.

The industry had just such individuals to contend with thirty years ago. Some of them repented; others are dead, and still others reaped what was coming to them in the way of economic punishment. But the industry of thirty years ago was insignificant compared with the industry of today, and public interest was infinitesimal then instead of universal as it is at present. Nor is it so easy now to separate the sheep from the goats; because one group merges into the other, which is to say that some sheep have quite long hair and curly horns, not to speak of cloven hoofs. The usual history of these periods of selling stock to investors which should be sold only to speculators who know they are speculating is that there is a smash or two, that the speculators run to cover, and that after a period of time the mess is cleaned up in the best way possible by the honest men concerned. What is to be hoped is that the smash, if it comes, will be on a small scale; for there was evidence enough last March of the possibilities.

As to the remedy, it is questionable whether much good will be served by legislation except such as is inevitable, and that will define the relations of the holding companies to the subsidiaries. A lot of such legislation is certain to be amateurish and will have the fault of being inconsistent in different states. That does not mean, however, that congressional legislation would be any less amateurish or any more consistent. As for congressional investigations, the country is pretty sick of them, because they consume much time and usually get nowhere. Much more would be accomplished if the executive branch of the government would exert itself and if the electric light and power industry, in defense of its good name and splendid record, would set up a code of ethics and ostracize those who refused to adhere to it.

Facts Versus Opinions in Plant Maintenance

YEAR after year the pressure upon operating engineers to achieve greater mastery of plant and equipment increases. The causes are in the last analysis economic. Progress in this direction demands foresight based upon skilled engineering judgment, and judgment requires accurate knowledge of conditions if sound decisions are to be reached. Opinions may be useful to a degree, but facts about plant and apparatus performance, status and outlook command chief respect.

In the field of maintenance the need of definite information is steadily growing. Modern electric light and power installations are commercial enterprises, and even though they contain new and untried elements, they are not experimental in any large sense. The time is now here for more thoroughly studying the whole maintenance problem, for co-ordinating experience and interchanging ideas and data in order that the unknown quantities may be lessened in number and value. Formerly the rapid growth of systems left little opportunity for what might be called the scientific study of maintenance, at least in many properties.

How shall this technique be attained in the utility industry? Not a few companies have begun to find the answer in more systematic records of inspection and repair work, combined with earnest study of these in relation to service results. There is more to the matter, however, than setting up a routine periodic examination of plant and equipment and checking off the different items every so often as the inspecting staff goes the rounds of the property. It is a truism to say that maintenance work should not be done until it is necessary, but what is the touchstone of this need? In a word, it is co-ordination of inspection and repair work with operating experience; it is the searching analysis of plant by which the engineer obtains facts and figures to take the place of opinions that this or that job should be undertaken at a stated interval or date. Fortified by such data, the safe lim-

its of deferred maintenance may be approximated, the factor of guesswork will be cut down, and an able course can be steered between the Scylla of neglect and the Charybdis of extravagance. For it is possible to waste money in maintenance no less than in construction, and the proper saving of money should never be lost from sight by the engineer through fascinated absorption in technicalities.

The Independent Jobber and the Electrical Supply Jobbers' Association

WIDE discussion of the economic status and the "political" situation of the independent jobber characterized the annual winter convention of the Electrical Supply Jobbers' Association at Atlantic City last week. The term "independent jobber" in prevailing parlance indicates the house that is not affiliated in any way with the General Electric, the Westinghouse or the Graybar group of distributors. The number of these "independents" has been appreciably thinned in recent years because of the many prominent jobbers who have joined the families of the two large electrical manufacturers, but there remain some fifty-odd of the "free-lance" members, who have formed a somewhat discontented minority.

It is inevitable that the small distributor operating "on his own" should look with anxiety upon the competition of those members of the three large groups who may be operating in his territory. In his eyes they stand for power. And he forgets that just as when a few independents talk together they discuss their fear of the big groups, so do the members of these large distributing systems when they foregather discuss their fear of the too often uneconomic competition of the "uncontrollable independent." Frankly, the General Electric distributor, the Westinghouse agent-jobber and the Graybar branch house have certain advantages over the small independent. By affiliation they have secured for themselves definite practical resources of co-operation such as in leadership, financing, publicity, cost knowledge and market information; but they have obviously sacrificed certain other advantages of freedom, mobility and economy which have always been and ever will be the defense of the small organization against the great. If by holding a separate group meeting of the "independent" members of the E.S.J.A. before each general meeting of the association the independents can acquire for themselves some of these added resources of group affiliation, it will be clear gain for them and for all. Improve the ethics and the economics of any group and the entire industry naturally benefits.

There is unquestionably need for a larger membership of independent jobbers in the national association of electrical distributors. The independent manufacturer can do no greater service to his distributors and to himself then to urge all the independent jobbers whom he supplies to join, now that it has been made easier and more inviting. The E.S.J.A. through its committee work has done much for progress in the electrical industry, but there are many problems of distribution that right now cry out for solution. An expanded and inclusive membership in this association under enterprising and purposeful leadership is one of the opportunities of the hour.

Taxation and Public Service

THE light and power industry has always been glad to pay taxes. It pays nearly 7½ per cent of its gross earnings in the shape of imposts to support the government, and it has long announced a policy of willingness to do more than its share in support of American institutions. This attitude has created public good will and is good business.

An article in the financial department of this issue shows that the light and power industry contributes a relatively higher proportion of its earnings for taxes than any other branch of industry or trade. It is relatively greater also than that paid by any other type of public utility. These data show that light and power leaders would be justified in calling for a readjustment of the tax assessments that would bring them more closely in line with those of other utilities and corporate enterprises. They show that the industry pays a disproportionately large sum to the public for the privilege of rendering public service.

The light and power industry, let it be repeated, has never objected to paying its share of taxes and has not even objected to the inequitable distribution of the tax burden. But it has failed to inform the public fully of what it contributes to the national tax bill or what its tax burden is in comparison with those of other enterprises. It would seem well worth while to tell the tax story to the public.

The Industry Conference on Wiring

THE Industry Conference on Wiring has held its first meeting and is at work on the solution of the problem that has been brought before it, which is an outgrowth of the controversy that has arisen between the power companies and the electrical contractors as to the influence of present trends in wiring practice upon the development of the electrical market.

The immediate issue is clear-cut. Is the all-metal standard of wiring normally more expensive than other wiring methods? And—whether more costly or not—is it exercising a restraint upon the development of the electrical market in communities where "all metal" is enforced by ordinance? The supporting facts are being marshaled, and the conference should sift the evidence, investigate conditions in the field, reach a conclusion and publish it. If any other remediable influence is discovered that is impeding the adequate wiring of homes, the conference should report that too, so that all the industry may know what is in the common interest. When this is done, then comes the real opportunity before this conference—to point out to all concerned, once they are in agreement as to the status and the trend of wiring, how the industry may best advance the work of adequately equipping the homes of America for the complete utilization of electric service. The introduction of more outlets into the great proportion of the homes now using electricity, the rewiring and refixturing of countless obsolete installations and the more generous provision of electrical facilities in all new-built houses—these are the objectives for the years immediately ahead in the field of wiring. And if this conference can focus the attention of the four major branches of the industry upon their common purpose in this direction the effort will not have been in vain.

Electric Refrigeration

Present and Future

UPWARD of a quarter of a million electric refrigerators—domestic and small commercial units—will be sold in the United States during the calendar year 1926. These, together with the ones already in use, will bring the total number connected to the lines of the power companies to about four hundred thousand. The existing retail refrigerator outlets—central-station companies, special dealers, distributors and others—variously estimate their next year's sales at from two to three times those of this year, or between a half and three-quarters of a million units. Manufacturers' production quotas total considerably more than these figures, but the aggregate volume of sales next year will be governed by a number of factors enumerated in detail in the survey of electric refrigeration published in this issue of the ELECTRICAL WORLD.

There is no doubt of the market possibilities for this device. Utility executives believe that from 10 to 30 per cent of their residential customers may be considered legitimate "prospects" for refrigerators at existing prices and at the present stage of development. The highest average saturation of domestic customers attained in any section of the country is 2.41 per cent, while the average for the country as a whole is only 1.78 per cent. If, however, dealers' sales estimates and manufacturers' production quotas for the year 1927 are to be realized, the development of electric refrigeration involves something more than estimating market possibilities, setting quotas and figuring the revenue from energy consumption or merchandising profit. Out of the mass of specific data, information and opinion gathered in the survey appear many factors which will affect the electric refrigeration business next year. Of these several conspicuously important elements may be set down as vital. They may be thus enumerated:

1. Manufacturers should turn out consistently high-standard equipment as nearly perfect in mechanical construction and final inspection as present-day facilities will permit. Deliveries of units and shipments of repair parts should be expedited, but in no case should quality be sacrificed for production.

2. Distributors should recognize and assume their responsibility as liaison officers between the manufacturer and the retail outlet, transmitting to dealers the installation, sales and service assistance which is particularly necessary in promoting the sale of relatively so new a device as the electric refrigerator.

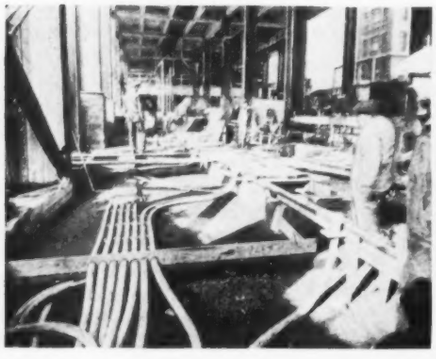
3. Central-station companies and all other dealers must recognize that the electric refrigeration business is highly specialized and that hit-or-miss methods in sales, installation or service carry heavy penalties in an aftermath of complaints, dissatisfaction and high servicing costs, 95 per cent of which could have been eliminated had care been taken at the start to see that salesmen, installation crews and service men were sufficiently trained.

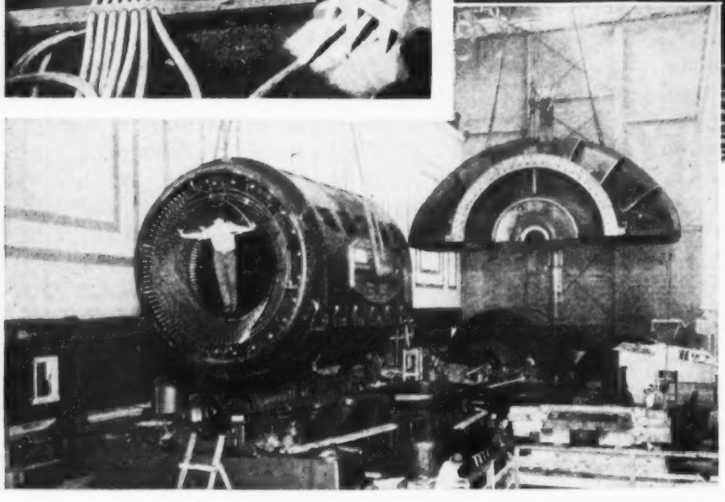
4. Granted that refrigerators will be of a uniformly high standard of manufacture and that deliveries will be prompt, there remains the problem of assembling adequate man power for selling, installing and servicing. These combine to form the neck of the bottle through which manufacturers' production must be squeezed to reach the at present unlimited market. Organization and training cannot be overdone if quotas are to be reached next year.

5. All engaged in electric refrigeration should be constructive in their attitude. Criticism of the machines, refrigerants or mechanical details of the product of competitors by salesmen or users reacts badly on a national policy of building the idea of electric refrigeration in the minds of the public.

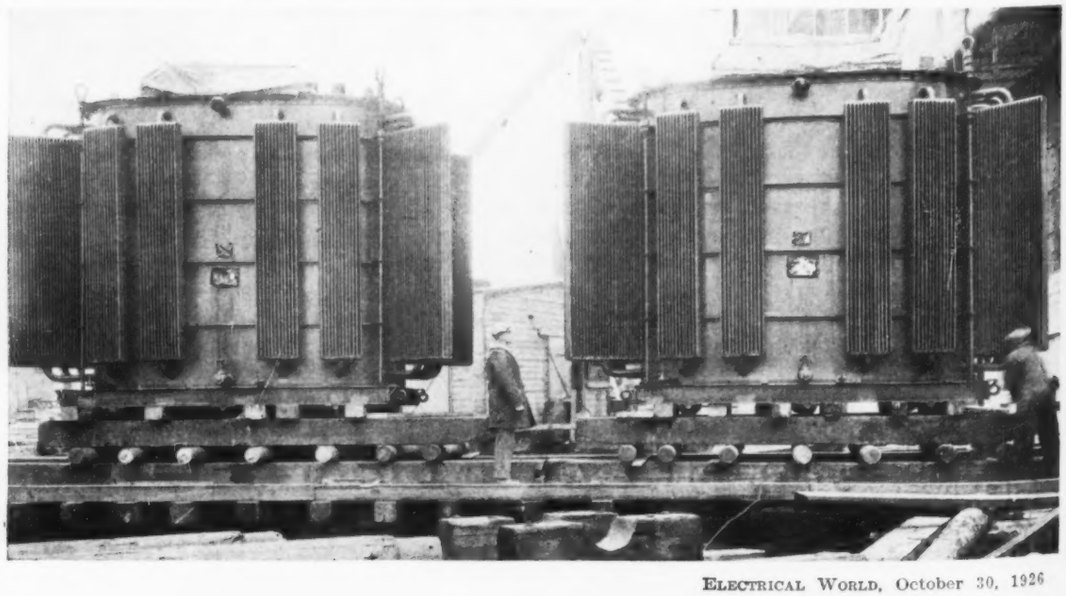
Fundamentally the electric refrigerators now on the market are satisfactory when properly made, inspected and installed. Comparatively little fault has been found with their design, and general acceptance has increased enormously in the last year, but the public still wants to be "shown." Whether in electric refrigeration next year and the years that follow are to be years of realization or years of disappointment will depend upon the extent to which this year's experiences are capitalized.

Handling Heavy Equipment for East River Station





ALTHOUGH the new East River station of the New York Edison Company is well along toward completion, as indicated by the Oct. 9 issue of ELECTRICAL WORLD, some steps in its erection progress are shown here and on pages 914 and 915. Above is a barge-derrick loading part of the rotor for a 40,000-kw., 25/60-cycle frequency changer tying the new station with Hell Gate station. To the left is the armature of one of the two 60,000-kw. turbo-generators being lowered onto the foundation. Below are two 15,000-kva. frequency-changer transformers.



Status of

Electric Refrigeration

Nationwide Investigation of Existing Conditions Indicates Imperative Need for Stabilization of Production, Selling and Servicing Practices—Saturation Only 1.78 per Cent of Domestic Customers — Distribution, Sales, Installation and Servicing Organizations Must All Be Strengthened

SPECIAL DEALERS' SALES FLOOR WHICH SHOWS DESIRABLE NEATNESS

ELECTRIC refrigeration in the last year has spread like wildfire throughout the entire country. Fostered by the electrical industry and supported by the approval of the central-station companies, it has attained a surprising degree of public acceptance. There can be no doubt that the domestic electric refrigerator has arrived. This year's sales have doubled and trebled, in many cases exceeding in the first seven and a half months of 1926 the sales quotas set for the entire year. All this has not been accomplished, however, without tribulation, and although there are outstanding cases of unprecedented success in the development of this business, there have been many disappointments. Power companies, long cognizant of the desirability of this load for their residential circuits, have had to face new and vastly different problems in sales and service organization and assume additional responsibilities to their customers and the public. Refrigerator manufacturers who have worked for years to bring this machine to its present degree of practicable perfection have likewise been confronted with serious production, sales and service problems. The general public, investment bankers, inventive genius, high-class manufacturing and sales talent have been attracted by the possibilities of this most recent development of the electrical and refrigeration industries. This popularity and the rapidly broadening market have created a condition that is somewhat unstable as to sales, service, financing, production and distribution practices. Market possibilities appear almost unlimited and the business promises enormous total profits through rendering a highly valuable service to mankind. Because this is so, electric refrigeration should be developed along the safest and sanest lines that will at once safeguard the interest of the ultimate user, the manufacturer, the electric utilities and other dealers.

Seeing the need for stabilization in the development of electric refrigeration and to help bring to bear the

Table I—Domestic and Commercial Electric Refrigerators in Use in 154 Localities as of Aug. 15, 1926

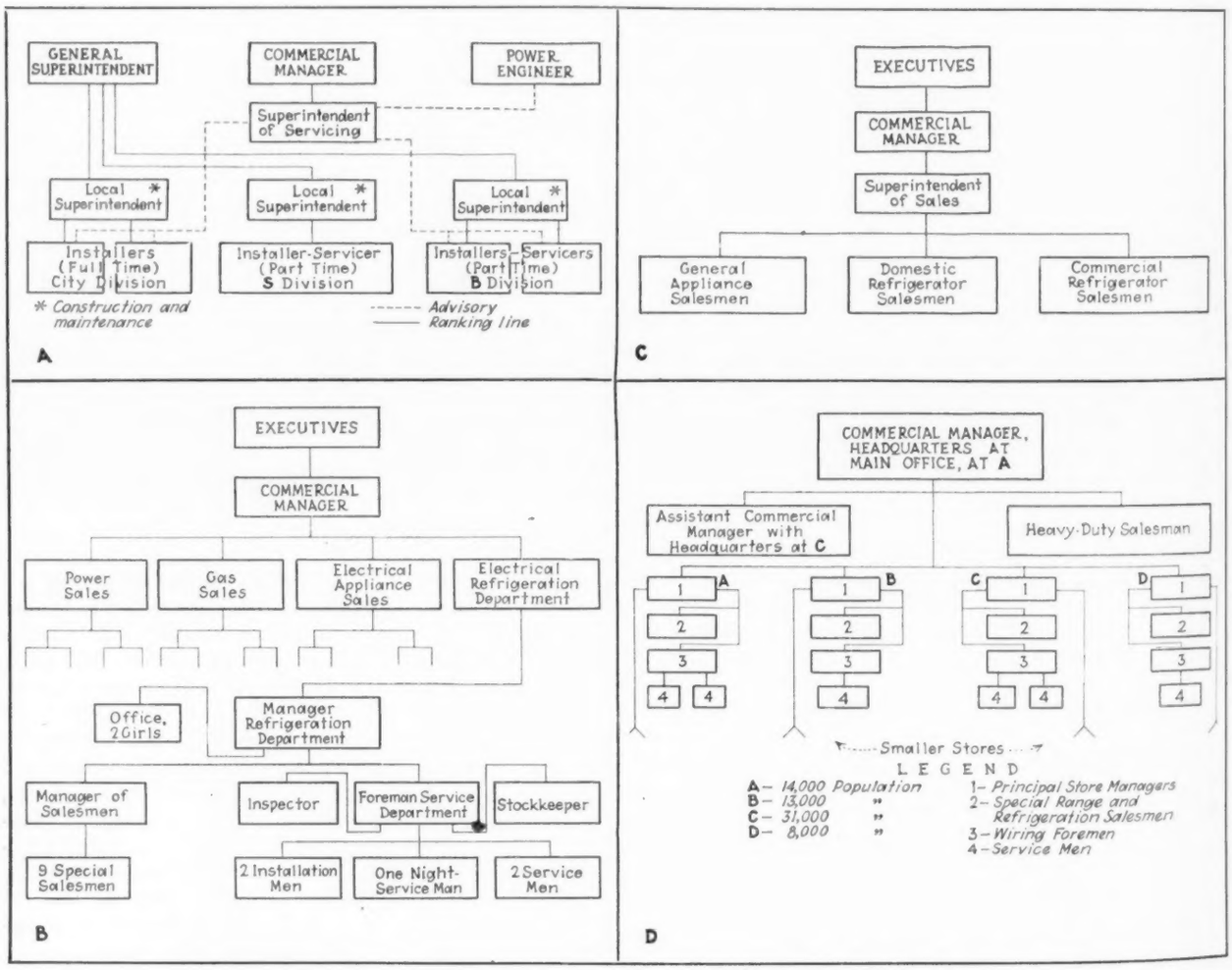
Section	Number of Localities Analyzed	No. of Customers in Localities Surveyed			No. Electric Refrigerators on Lines			Per Cent of Customer Saturation		
		Domestic	Commercial	Total	Domestic	Commercial	Total	Domestic	Commercial	Total
East	41	1,139,950	239,110	1,379,060	22,810	5,222	28,032	2.00	2.18	2.03
South	36	470,000	94,600	564,600	11,326	3,585	14,911	2.41	3.79	2.65
Mid-West	52	1,634,100	287,500	1,921,600	27,790	9,665	37,455	1.70	3.36	1.95
West	25	634,300	117,850	752,150	7,325	2,818	10,143	1.15	2.39	1.35
Total	154	3,878,350	739,060	4,617,410	69,251	21,290	90,541	1.78	2.88	1.96

best thinking and experience on this matter existing in the industry, the editorial staffs of the ELECTRICAL WORLD, *Electrical Merchandising* and *Journal of Electricity* have conducted a nation-wide survey of the situation as it exists today. The survey has been made by personal investigation on the ground.

EXTENT OF SURVEY

Upward of 200 localities were visited and individual reports prepared covering 195, of which number 154 have been tabulated in detail. This tabulation, which is published as a supplement to this issue of the ELECTRICAL WORLD, covers information as to executive reaction to the business, relations with the ice industry, sales, sales quotas, sales methods, servicing, interrelations among local dealers, distributors and manufacturers. The survey reporters have made a frank estimate of the capabilities of local outlets, and taking into consideration all factors, have appraised the present status of the local situation with respect to the past and probable future trend.

Of the localities analyzed 41 are located in the East, embracing the New England states, New York, Pennsylvania and south to the Potomac River; 36 are in the South, including those states below the Ohio River and east of the Mississippi, as well as Oklahoma and Arkansas; 52 are in the Middle West, considered to include Ohio and Michigan, west to the Colorado, Wyoming and Montana line; 25 are in the West, embracing Texas, the Mountain and Pacific states. In the



CENTRAL-STATION ELECTRIC REFRIGERATION SALES AND SERVICE ORGANIZATION

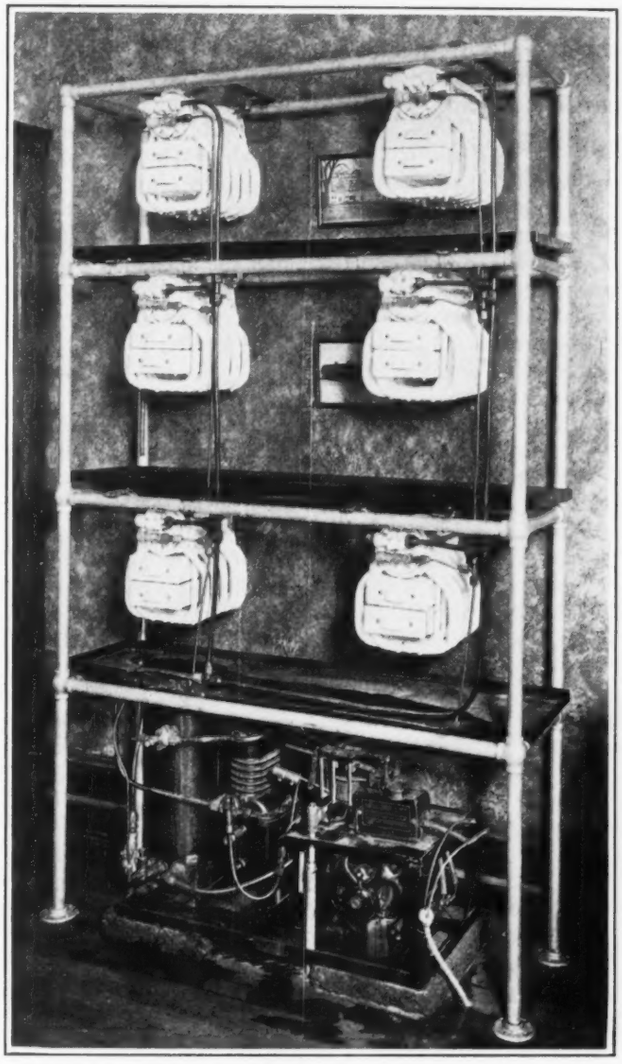
A. How one utility in a city of 75,000 has successfully utilized existing organization to build a refrigeration installation and service force.

B. Sales, installation and service department entirely separate from regular departments of a company of 400,000.

C. Sales organization, showing separation of special refrigerator salesmen from general sales force.

D. Sales and service facilities of a company serving a number of towns from 5,000 to 15,000 population over fairly widespread territory.

154 localities as shown in Table I there are 3,878,350 residential and 739,060 commercial customers, making a total of 4,617,410, or approximately 26.6 per cent of all the domestic and commercial lighting customers in the United States as of Jan. 1, 1926. Thus the survey has covered a little more than one-quarter of all the customers of the power companies and may be considered fairly to represent a typical cross-section of the entire country. It should be noted that in conducting the survey and making up the tabulation every effort has been made to avoid unusual conditions that would tend to distort the situation as a whole. The towns selected for study are representative, but in nowise should they be considered a hand-picked list. In such metropolitan centers as New York, Chicago, Philadelphia and San Francisco the utility companies, distributors and dealers were interviewed and much valuable opinion was obtained. It was not considered practicable, however, to include in the tabulation figures on sales or quotas in these large cities.



APARTMENT HOUSE EQUIPMENT USED AS WINDOW DISPLAY

Standing out head and shoulders above all else as viewed from a national standpoint are two things of particular significance to the central-station industry and to the electric refrigerator manufacturers: First, among utility executives there is a striking, almost unanimous, approval of the electric refrigerator as a load and revenue builder. Opinion differs somewhat as to sales methods, service organization and manufacturer's ability and willingness to supply repairs and sales and service help. Second, where the central-station company or other dealer has competent, fully organized sales, installation and service departments and where the refrigerators sold are of a high standard in manufacture and inspection, the sales volume has equaled and often exceeded expectations and the service obligation on machines in use has been less than was expected.

Actual sales of electric refrigerators by the power companies when compared with total sales by all dealers are also particularly significant as a measure of the central-station influence on public acceptance and the importance of these companies as a retail outlet. In the 154 localities analyzed the utilities sold 31.9 per cent of the domestic and 20.5 per cent of the commercial refrigerators sold by all dealers. There were 30 of these localities in which the power companies are not, as yet at least, engaged in the sale of electric refrigeration.

It is of interest to note that a year ago very few of the central-station companies were in any way equipped for the sale and servicing of electric refrigerators other than their regular appliance sales departments and the usual service and repair facilities. Salesmen, installation crews and service men all had to be trained, and right here let it be said that without the sales and service training schools organized and maintained by the manufacturers the sales of electric refrigerator units would be far less than they have been to date. Much still remains to be desired in the ability and availability of sales and service men, but special training is certainly a fundamental requisite.

Recapitulation of the number of electric refrigerators in use shows that as of Aug. 15, 1926, in the 154 localities investigated there were on the lines of the central-station companies 69,251 domestic and 21,290 commercial electric refrigerators, a total of 90,541. This represents an average saturation of 1.78 per cent of the domestic customers. Some allowance might be made for new customers added to lines since the first of the year, which would slightly lower the degree of saturation. Data for the four geographic divisions are shown in Table I, and it will be seen that there is quite a wide variation in the degree of saturation, especially on domestic units. The South has the highest degree of saturation, 2.41, while the West has the lowest, 1.15. The East and Middle West lie midway between the other two divisions with saturation factors of 2.00 and 1.70 respectively. Climatic and temperature conditions partly account for the difference, but there are other factors, which will be discussed later.

Assuming that the conditions found in the 154 localities represent a fairly accurate cross-section of the entire country, the foregoing may be used as the basis for tabulating the total number of electric refrigerators in use on the lines of all the power companies in the United States. This is shown in Table II, giving the number of domestic and commercial customers by sections and the number of electric refrigerator units—260,365 domestic and 78,681 commercial. The combined

Table II—Approximate Number of Domestic and Commercial Refrigerators in Use in Country as a Whole

	Number of Customers			No. Electric Refrigerators on Lines			Per Cent of Customer Saturation		
	Domestic	Commercial	Total	Domestic	Commercial	Total	Domestic	Commercial	Total
East	4,803,300	999,030	5,802,330	96,066	31,778	117,844	2.00	2.18	2.03
South	1,813,050	365,120	2,178,170	43,694	13,838	57,532	2.41	3.79	2.65
Mid-West	5,395,450	948,050	6,343,500	91,612	31,854	123,466	1.70	3.36	1.95
West	2,521,130	469,080	2,990,021	28,993	11,211	28,993	1.15	2.39	1.35
Total	14,532,930	2,781,280	17,314,210	260,365	78,681	339,046	1.78	2.88	1.96

total of 339,046 electric refrigerators in use in the country as a whole checks very closely with other data and estimates that have been derived from entirely different and independent sources.

UNITS SOLD IN 1926

Total sales of electric refrigerators by all classes of dealers from Jan. 1 to Aug. 15, 1926, in the localities surveyed were 51,304 units, of which 44,091 were domestic and 7,213 were commercial, according to the figures on sales as given by the local retail outlets. In some instances domestic and commercial sales were not segregated, hence the proportion of commercial units sold has been somewhat higher than the foregoing ratio would indicate. However, in a number of places dealers and central-station companies are not well organized to handle the commercial business as yet and some manufacturers do not make this type of unit.

Again projecting the sales in the 154 localities containing 26.6 per cent of the domestic and commercial customers of all the power companies in the United States, total sales for the first seven and one-half months of 1926 have been 165,287 domestic and 27,279 commercial units, or 192,566 in all. Comparing the sales this year with the total number of electric refrigerators installed to Aug. 15, estimates based on survey figures show that on Jan. 1 this year there were in use 146,480 units, of which 95,078 were domestic and 51,402 were commercial. Thus up to the time this survey was made one and a third times as many electric refrigerators had been sold in 1926 as were already in use at the beginning of the year. What the sales will be by Dec. 31 is highly problematical. Some dealers considered that their sales during the first seven and a half months represented only 60 per cent of the year's business. Others were not so optimistic and felt that the remainder of the year would account for a rather small share of total sales in 1926. It would seem fairly conservative, in the light of sales to date, that 250,000 domestic and commercial refrigerating units will have been sold during the year 1926.

Sales estimates and quotas for 1927 are of vital interest to the central-station companies, refrigerator manufacturers and retail dealers. These will be discussed in connection with market possibilities after considering the elements that have affected the refrigerator business during the present year and their probable influence upon the development of future sales.

Referring to the key tabulation which is published as a supplement to this issue of the ELECTRICAL WORLD a composite picture of the present status of electric refrigeration will be found. This table was set up in the form of a work sheet upon which could be assembled the definite and essential facts contained in the field reports as the result of personal interviews with utility executives and sales managers, distributors and dealers. The 154 localities have been divided into four geographical sections and the approximate number of domestic customers served by the local power company is given. Under each locality data are shown for each of the different dealers in that locality. The make of refrigerator handled by each dealer has been designated by an alphabetical letter, A, B, C, etc., and the expressions of opinion, this year's sales and next year's sales quotas have been carried through for each outlet.

UTILITY EXECUTIVE OPINION

Virtually every president or general manager of the electric light and power companies expressed himself as being highly interested in the development of domestic electric refrigeration. There is no question in their minds as to the desirability of the business from a load

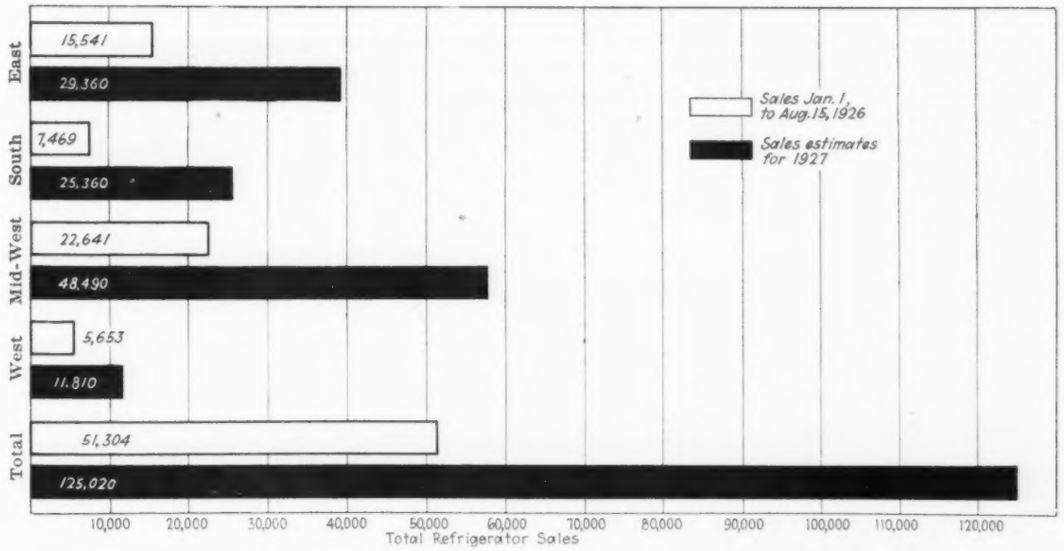
Table III—Domestic and Commercial Electric Refrigerator Sales by All Classes of Dealers in 154 Localities Jan. 1 to Aug. 15, 1926

Domestic Refrigerators

	East		South		Mid-West		West		Total	
	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent
Central stations	4,243	29.8	2,769	44.7	5,655	29.9	1,353	28.4	14,020	31.9
Distributor-dealers	6,063	42.7	1,748	28.3	8,725	46.2	1,144	24.1	17,680	40.1
Special dealers	2,197	15.4	813	13.2	3,112	16.4	1,263	26.6	7,385	16.7
Electrical dealers	1,051	7.4	497	8.1	817	4.3	380	8.0	2,745	6.2
Department and furniture stores	192	1.3	14	0.2	325	1.7	403	8.4	934	2.1
Oil-burner dealers	267	1.9	75	1.2	77	0.4	....	....	419	1.0
Hardware dealers	10	0.1	177	2.9	95	0.5	72	1.5	354	0.8
Miscellaneous	200	1.4	84	1.4	114	0.6	147	3.0	554	1.2
Total	14,223	100	6,186	100	18,920	100	4,762	100	44,091	100

Commercial Refrigerators

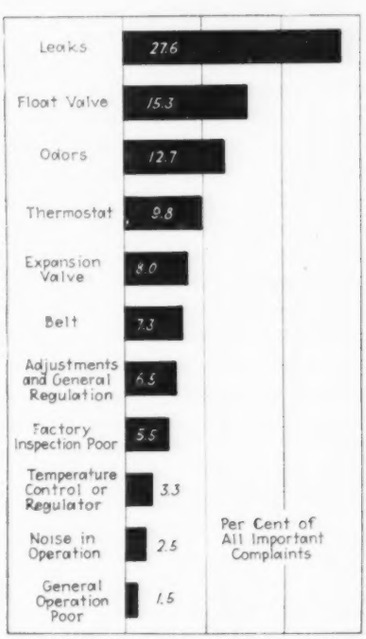
	East		South		Mid-West		West		Total	
	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent
Central stations	165	12.5	431	33.6	767	20.6	88	9.9	1,451	20.5
Distributor-dealers	896	68.0	554	43.2	2,460	6.1	450	50.5	4,360	60.3
Special dealers	107	8.1	256	19.9	382	10.3	353	39.6	1,098	15.1
Electrical dealers	96	7.3	40	3.1	60	1.6	....	....	196	2.6
Department and furniture stores	50	3.8	....	....	....	....	....	....	50	0.7
Hardware dealers	....	....	....	....	52	1.4	....	....	52	0.7
Miscellaneous	4	0.3	2	0.2	....	....	....	....	6	0.1
Total	1,318	100	1,283	100	3,721	100	891	100	7,213	100
Total domestic and commercial	15,541		7,469		22,641		5,653		51,304	



1927 SALES ESTIMATES OF ALL EXISTING DEALERS IN 154 LOCALITIES REPRESENTING 26.6 PER CENT OF ALL CUSTOMERS

and revenue standpoint. As one holding company president expressed it: "I have felt for twenty years that the electric refrigerator would be the very best household device we could add to our lines if we could get a machine that would work. This has been accomplished and we are pushing it hard." Another vice-president and general manager said: "Electric refrigeration is the salvation of the residential business." He estimated that in five years one-third of his domestic customers will have electric refrigerators and that these will increase his residence bill 50 per cent.

Little need exists to "sell" the utilities on the value of the load. Reviewing the attitude of utility executives in the 154 localities, it is found that 104 central-station company executives expressed themselves as highly favorable toward electric refrigeration, 40 assumed a conservative or neutral attitude and only ten could be classified as unfavorable or indifferent. The attitude of the majority of those classed as conservative or neutral, it is interesting to note, was due either to unfortunate experience in sales or servicing or to the utility executive's consideration for the local ice interests. Those few classed as unfavorable apparently had no interest in any form of load building or were skeptical as to the present state of development. Of the 30 companies not selling electric refrigerators, some are planning to enter the field next year and others are making plans for extensive co-operation with existing local outlets. On the whole, the investigation shows an exceptional interest on the part of central-station executives in the commercial possibilities of the refrigeration business. Furthermore, they have taken an unusually keen interest in the sales and servicing details and the performance of the units in actual operation.



MOST USUAL CAUSE OF SERVICE CALL OR SOURCE OF TROUBLE

Important causes for complaints or dissatisfaction with all makes of electric refrigerators as reported by retail selling outlets.

Favorable as is the executive reaction to this business, there does exist a considerable amount of criticism of some of the methods that have prevailed this year in the manufacture, sale and servicing of electric refrigerators. Unfortunate experiences that some companies have undergone in excessive servicing requirements have created doubt in the minds of many as to the degree of mechanical perfection yet attained. It is pretty generally recognized, however, that most of this type of trouble may be laid at the door of hasty producing methods and inadequate factory inspection or improper installation of the unit on the customer's premises. Refrigerator manufacturers in a great many cases have come in for very pointed criticism because units have been shipped out of the factory entirely lacking in final inspection and showing unmistakable evidence of too hurried assembly. During the spring and early summer rush to get deliveries there appeared a veritable epidemic of trouble due to poor factory inspection. This was by no means confined to any one make of machine. To the credit of the manufacturers, immediate steps were taken to correct this situation, but utility men are emphatic in their demands that the equipment be of a consistently uniform and high standard of workmanship.

Servicing costs are generally felt to be high in proportion to the revenue received from energy consumption. Accurate data on this phase of the business are meager, but there is a feeling among executives that in view of the high sale and service costs and the fact that the electric refrigerator must still be considered in the pioneering stage there is scarcely enough margin in present discounts to cover these costs, let alone a merchandising profit. A few companies have deemed it advisable to proceed rather cautiously in promoting

Table IV—Type of Salesmen Used by Central-Station Companies and Other Dealers

Section	Central Station: No. of Localities	No. Selling Refrigerators	Resale Plan	Special Salesmen	Gen. Sales Force	Special Men and Gen. Sales Force	All Other Dealers: Total No. Outlets Considered	Resale Plan	Special Salesmen	Gen. Sales Force	Special Men and Gen. Sales Force
East	41	34	3	18	13	1	92	1	60	31	2
South	36	29	1	13	15	2	60	0	18	42	..
Mid-West	52	46	2	23	21	2	59	2	40	17	..
West	25	15	0	7	8	3	44	..	27	17	..
Total	154	124	6	61	57	8	255	3	145	107	2

the sale of the electric refrigerator because they believe it subject to radical changes in design and possible sharp price reductions, either of which would result in dissatisfaction by customers, particularly those who have bought on long-time payments.

Sales, service and advertising assistance as rendered by manufacturers has for the most part been of an exceptionally high order, and the utilities are anxious that these facilities be expanded to meet the needs of the increasing market. There is room for improvement in the servicing of customers' installations, and utilities feel that for the present at least both they and the manufacturers must adopt a very liberal policy in the matter of labor and material for repairs. Typical of this attitude is this statement by a general manager of one of the large companies: "Service is most important. We will service any make of machine, because we want to get it back on our lines that very day and impress upon the customer the value of the service he is receiving."

Although it is possible to pick flaws in any new device, the majority of companies feel that the electric refrigerator has reached a stage of development where they can safely recommend it to customers. "Defects in the product," said one executive, "have given about as little cause for criticism as a new product of this kind could be expected to give, although it is by no means perfect." "As to the electrical and mechanical considerations," said another, "all refrigerators of standard manufacture can be depended upon to perform consistently, continually and satisfactorily, provided they are installed in accordance with the manufacturer's rules and instructions."

Power companies have taken up the sale of electric refrigeration because it has fitted in admirably with their program of load and business development. It has been recognized that the central-station company's stamp of approval on this comparatively new device would have a strong influence in creating confidence in the minds of customers, and the fact that the utility is itself selling electric refrigerators has proved a valuable asset to other dealers in the same locality. No utility company expects or wants to sell all or even a majority of the refrigerator units in its territory; in fact, the entrance of competent dealers in the business is welcomed and encouraged. The relation of the central-station company to other refrigerator outlets may be summarized in the policy enunciated by a utility president widely known in the industry for his keenness in commercial sales problems. He stated that his company entered the field to stimulate business at the written request of leading dealers and with due appreciation of the load-building possibilities.

Relations with Ice Industry

Introduction of electric refrigeration has raised the question of its probable effect upon the business of the local ice companies, which have in some cities evinced considerable alarm over what has appeared to them to be an invasion of their rightful field. For the power companies this has been a rather delicate problem, because in many instances they have been supplying nearly all power requirements of local ice plants. To complicate the situation, a number of advertisements were published in the early stages by both the ice companies and the electric refrigerator advocates that were derogatory to the other's product. Fortunately both sides of the controversy quickly recognized the uselessness of such a policy and discontinued their vituperative attacks upon each other. As a matter of fact, the publicity now being given to refrigeration, whether it be electric or ice, is increasing business for both, according to experiences from some localities.

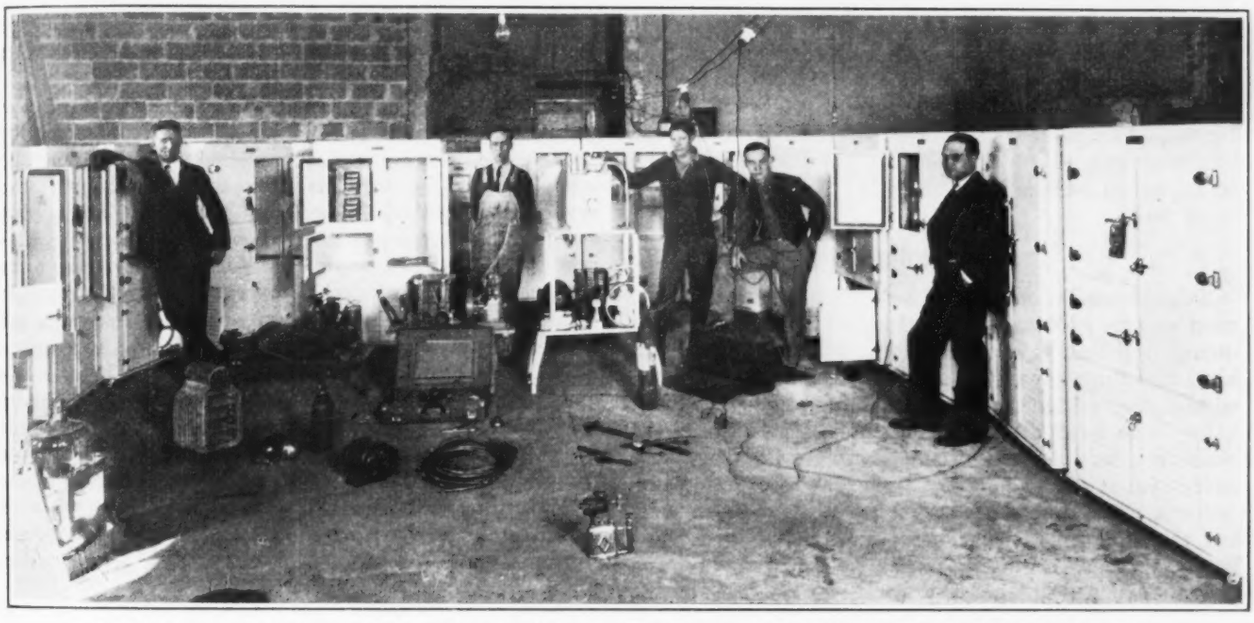
The situation was handled in one city of about a quarter million population in this manner: Shortly after the central-station company commenced selling electric refrigerators 30 members of the local ice association called a meeting, at which the president of the utility company was present. The ice manufacturers stated their case, which virtually accused the power company of trying to put them out of business. The utility executive then explained his company's attitude

Table V—Ratio of Salesmen to Domestic Customers in Fifteen Typical Localities

Section	Central Station: No. Domestic Customers	No. of Salesmen,	Customers per Salesman	All Other Dealers: No. of Salesmen	Customers per Salesman	Totals: No. of Salesmen, All Dealers	Customers per Salesman
West	2,000	1	2,000	1	2,000	2	1,000
East	5,000	4	1,250	4	1,250	8	625
Mid-West	7,500	1	7,500	2	3,750	3	2,500
South	11,000	5	2,200	6	1,833	11	1,000
East	14,000	2	7,000	4	3,500	6	2,333
East	20,000	6	3,333	6	3,333	12	1,666
Mid-West	30,000	1	30,000	10	3,000	11	2,727
West	50,000	7	7,142	20	2,500	27	1,851
Mid-West	80,000	9	8,888	20	4,000	29	2,757
East	80,000	15	5,333	17	4,758	32	2,500
Mid-West	100,000	20	5,000	20	5,000	40	2,500
Mid-West	120,000	6	20,000	18	6,666	24	5,000
East	170,000	18	9,444	51	3,333	69	2,463
Mid-West	180,000	8	22,500	12	15,000	20	9,000
East	250,000	11	22,727	62	4,032	73	3,438
Total	1,119,500	114	9,819	253	4,424	367	3,050

—that all advertising had been fair; that absolutely no mention of ice had or would be made; that electrical refrigerators were going to be sold in the city anyway and that some unscrupulous dealers might employ questionable tactics against the ice dealers if the central station were not in a position to exercise its influence. He then explained the value of better refrigeration and pointed out that in that locality the market for ice was less than 50 per cent developed. The meeting closed by the ice association extending the utility president a vote of appreciation for his suggestions, and, like the fairy tale, relations have been harmonious ever since.

There are a number of instances of local ice companies taking on the sale of electric refrigerators, and one large ice and cold storage company has developed a



REFRIGERATION WAREHOUSE AND REPAIR SHOP OF UTILITY WHERE ALL MACHINES ARE TESTED AND RUN IN FOR TWO DAYS BEFORE INSTALLATION

domestic electric refrigerator that is being marketed extensively throughout the country. It seems likely that the solution of the ice manufacturer's problem may be in offering a refrigerator service by tying up with some good electric refrigerator and offering either mechanical or ice refrigeration.

MAKES OF REFRIGERATORS SOLD

In tabulating the data contained in the field reports it was found that 28 different makes of electric refrigerators occurred with sufficient frequency to be included. This of course does not include all of the machines that have been produced, as there are 93 or 95 different makes on the market, some having built less than 25 units. There are also about 150 or 160 more in some stage of development. But unless a refrigerator has attained a fair degree of retail outlet representation it has been impossible to include it in the tabulation. It is not the intention and no attempt has been made to draw comparisons of the relative merits of different makes of electric refrigerators.

SELLING OUTLETS

Of the 154 central-station companies visited, 124 are actively engaged in selling electric refrigerators. There are 65 distributor-dealers—that is, distributors or what might almost be termed factory branches maintaining extensive retail selling organizations—84 special dealers who sell electric refrigerators exclusively, 86 electrical dealers or contractors, seventeen department or furniture stores, eleven oil burner or house-heating concerns, fifteen hardware stores and 34 miscellaneous dealers, including radio shops, plumbers, garages, auto supply houses, free lances and small agents. Total sales by each class of dealer during the first seven and one-half months of this year are shown in Table III. As might be expected, the distributor-dealer organizations have the highest percentage of sales, 40.1 per cent of domestic and 60.3 per cent of commercial units. Nearly all of the distributor-dealers have been in business from two to five years and in that time have built up substantial sales and service departments and have acquired a great deal of valuable experience in the technique of the business. The central-station companies have accounted for 31.9 per cent of domestic and 20.5 per cent of commercial units sold, which, in view of the fact that most of them have been active for but a little more than a year, speaks very well for their ability to turn such an effective selling organization into a specialized field on such short notice. Special dealers have sold 16.7 per cent of the domestic and 15.1 per cent of commercial units, indicating the importance of specialization in this business when compared with the sales of other dealers who handle electric refrigerators as an adjunct to their regular business. Electrical contractors and dealers have made a very good showing, selling 6.2 per cent of the domestic machines and 2.6 per cent of the commercial. Sale of electric refrigerators fits in very well with the electrical contractors' business, because frequently the installation work requires a certain amount of wiring, especially for remote compressors. The low percentage of the total sales, 5.1 per cent domestic and 1.5 commercial, made by the department and furniture stores, oil-heating, hardware and miscellaneous dealers combined can be attributed to the specialized nature of the sales and service organization required, which these outlets hesitate to set up.

Table VI—Sales Plan Used or Advocated by Central Stations and All Other Refrigerator Dealers

Section	Central Station: No. of Localities	No. Selling Refrigerators	Continuous Sales Plan	Continuous with Campaigns	Seasonal Sales Plan	All Other Dealers: Total No. Considered	Continuous Sales Plan	Continuous with Campaigns	Seasonal Sales Plan
East	41	34	25	2	7	92	79	..	13
South	36	29	16	13	..	60	51	9	..
Mid-West	52	46	15	15	16	59	49	1	9
West	25	15	11	4	..	44	43	1	1
Total	154	124	67	34	23	255	222	11	23

The high percentage of total commercial unit sales made by distributor-dealers, central-station companies and special dealers indicates again the value of specialization in the business. It has generally been found that unless a dealer has a salesman who is specially trained in the commercial phase of refrigeration and who is something of a refrigeration engineer, misapplications may be made or inadequate equipment may be sold and as a result the commercial sales will be retarded. Central-station power salesmen have worked out very well in this respect and the distributors and some special dealers are adding to this branch of their sales forces.

SELLING METHOD USED

Sales organization and selling methods have been the most serious problems confronting all classes of dealers during the last year. Salesmen competent to do this kind of selling have been scarce. Few had any knowledge of the article they were to sell and although a great many have been attracted and undergone training at manufacturers' schools, the percentage developed into successful salesmen has been relatively low. One distributor pointed out that only 7 per cent of those passing through the salesmen's training course had made good in actual selling. Another distributor declared that man power in the sales forces is the neck of the bottle through which next year's sales must pass.

Power companies are about evenly divided at present in the use of special refrigerator salesmen or their general sales force—61 companies employ special salesmen, 57 use their general sales force and eight are using special men assisted by the general sales force. Only six of the 124 companies have so far entered into resale agreements with manufacturers whereby the power company does a certain amount of advertising, displays the equipment in salesrooms and carries the time payments while the distributor or manufacturer does the actual selling, installing and servicing. This method of selling has only recently been available for electric refrigerators and promises to develop to a considerable extent.

A great many companies are using their general sales force for refrigerator selling, because no specially trained men were available and it is pretty generally agreed that it is more desirable to have men who can devote their entire time to this business. Some companies have found it advantageous to have their electric range salesmen work on refrigeration at the same time, as, in the West, range users have often proved to be the best prospects for refrigerators. However, the use of the general sales force has had a tendency to draw salesmen away from other lines, and as a consequence most companies are taking steps to build up crews of special refrigerator salesmen. For this purpose the manufacturers' training courses have been found most effective. One to two weeks of such extensive training has usually been sufficient for men with an aptitude for the work, but it usually takes from one to three months' selling effort in the field for a man to hit his stride.

Other dealers than the power companies are even more inclined to the use of special salesmen, which is natural in view of the fact that both distributor-dealers and special dealers are essentially in a specialized business. Only three dealers outside of the utilities were found to be operating under resale plans. Table IV shows the practices of central stations and other outlets with respect to their sales forces.

The ratio of salesmen to number of customers is a question that has been raised in every locality where electric refrigeration is sold. Among individual dealers there has been very little opinion as to the maximum number of salesmen that could economically work in a given territory, as no dealer has felt that his sales force approached this limit. One power company that has been very successful in the sale of electric refrigerators and has attained a saturation of about 3 per cent of its domestic customers used all of its general salesmen and special refrigerator salesmen in a series of campaigns. During these activities a ratio of one salesman to 1,500 domestic customers was maintained. At other times each special refrigerator salesman may be said to cover about 10,000 customers, with the general force turning in prospects. In this connection considerable success is being met in the employment of junior salesmen who do no selling but do house-to-house canvassing to uncover prospects or leads and make definite appointments for the regular salesman to call and go into the full details of electric refrigeration.

Table VII—Major Sales Resistances in Selling Electric Refrigerators

	Number of Dealers: East	South	Mid-West	West	Total
Sales resistance	101	46	101	58	306
First cost	74	46	83	50	253
Expect price reduction	36	10	31	9	86
Unconvinced of final development and mechanical perfection	24	16	45	21	106

Table VIII—Service Guarantees and Charges for Repairs

Central Station		All Other Dealers	
Free Service Guarantee			
Number of expressions	110	Number of expressions	173
One year	103	Year	150
Two years	1	Six months	3
Fifteen months	1	Three months	27
Continuous	5	Continuous	3
Charge for Repairs			
Number of expressions	20	Number of expressions	20
Charge after year	20	Charge after year	20
Charge for Labor			
Number of expressions	10	Number of expressions	13
Charge after year	10	Charge after year	13

The number of domestic customers per refrigerator salesman in fifteen typical localities is shown in Table V. There is such a wide variation in the practices of both the power companies and all other dealers that it is almost impossible to discover any trend. If average figures can be accepted, it would appear that there is about one refrigerator salesman to every 3,000 domestic customers. Power companies alone show an average of one salesman to nearly 10,000 domestic customers. Judging by the success of some companies and from market possibilities, it would seem that the ratio of salesmen to customers that could be employed by all dealers without stepping on each other's toes too often would be about one to 1,500. For the central-station company alone the ratio might run from this figure up to one to 10,000 customers, varying inversely with the intensity of effort the company desired to make and how well other retail outlets were doing a selling job. Ability to find and train salesmen will probably keep these ratios fairly high for some time.

Admittedly the late winter, spring and summer months have this year represented the peak sales period for all dealers. This seasonal feature of the business is undesirable alike to manufacturers, central-station companies, distributors and other outlets, and there is a strong tendency, as shown in Table VI, to get away from seasonal sales plans and make the effort as continuous as possible. Sixty-seven of the 124 central-station companies and 222 of the 255 other dealers declared themselves in favor of continuous year-around sales effort, whereas 34 power companies and eleven dealers favor a continuous plan interspersed with seasonal campaigns. A decided minority of dealers were inclined to seasonal selling, and the specialized nature of the business indicates that from an economic standpoint selling effort should be spread as evenly over the twelve months as possible.

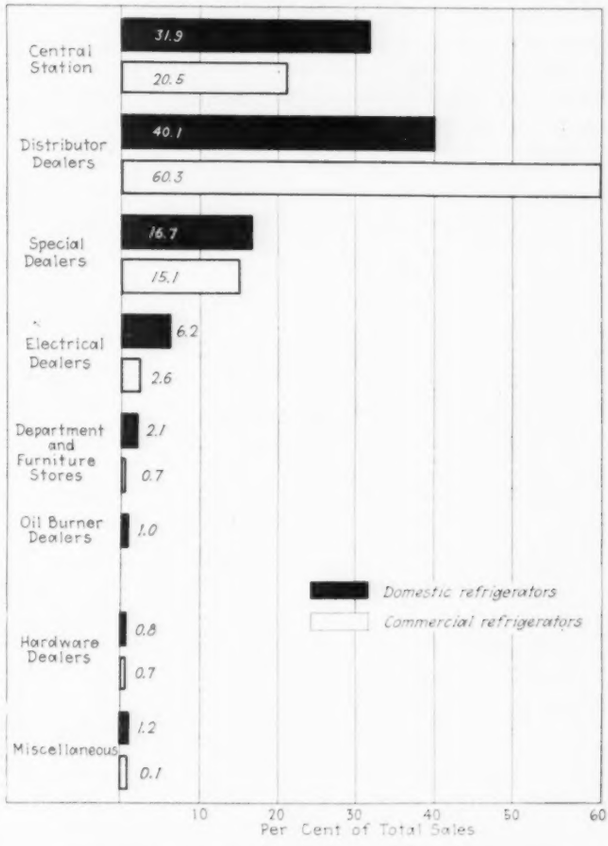
COMPENSATION OF SALESMEN

Methods of paying salesmen vary widely, particularly among power companies. Straight salaries, salaries plus commissions, drawing accounts against commissions and straight commissions may be found. It is commonly agreed that refrigerator selling requires a high type of salesmen and that the remuneration must be sufficient to attract and hold them. It should be possible for them to earn from $250 to $500 per month and even more during the most active part of the year. Straight commissions of 10 per cent of the installed price have worked out well in a number of places, whereas in others commissions as high as 15 per cent on factory list, not including installation charge, has proved satisfactory. Another company has obtained good results with a flat salary of $150 a month plus 2 per cent commission on the installed price. Still another company pays its salesmen $50 a month and 7½ per cent commission on factory list. The most popular method among dealers appears to be a flat 10 per cent commission on total price to the customer.

TYPICAL REFRIGERATION DEPARTMENTS OF UTILITY COMPANIES

Organization of the central-station company for sales, installation and service of electric refrigeration has been repeatedly emphasized as of primary importance to the successful development of this business. A great many companies are at something of a loss to know what would be the most practicable set-up for such a department. Good results have been attained in a number of companies by somewhat different methods. The plans of refrigeration department organization of four widely separated utilities that have done an outstanding job in refrigeration selling are shown at the outset of this article. Chart A represents the more conservative practice of a company that has utilized its existing service departments, upon which has been superimposed the electric refrigerator installation and service department. In this locality the growth of electric refrigeration has not been phenomenal, but it has shown a steady increase, and this arrangement has worked out well to date.

In direct contrast with this is the company represented by Chart B, where the company has set up a



PROPORTION OF TOTAL DOMESTIC AND COMMERCIAL REFRIGERATORS SOLD BY ALL CLASSES OF DEALERS

refrigeration department entirely separate from its regular sales and servicing departments. The new department is made up of nineteen men and two women, including the manager of the department, who has complete charge of all ordering, sales and service and reports directly to the commercial manager of the company. The co-ordination of sales and service under one authority has been found to have many advantages.

Much detail in handling salesmen is taken care of by the manager of the salesmen, who is paid a salary plus a commission on total monthly sales. He reports directly to the manager of the refrigeration department. Each salesman works in a restricted territory that includes about 7,000 meters, both commercial and domestic. All sales in that territory are credited to the salesman, whether made by him or at the company's store. In

receiving credit for store sales, however, the name of the customer must have been previously turned in by the salesman as a prospect. The salesmen are paid a straight commission based on factory list prices. A drawing account is allowed the salesman during the first three months of employment while he is learning the business.

Orders properly approved by the manager of the refrigeration department and the credit department are sent with specifications drawn up by the salesman to the foreman of the service department. The foreman records the order, including the time it was received in his office, and then turns it over to the inspector. The inspector goes to the customer's house, checks all specifications made by the salesman, makes a sketch of the kitchen and the location of the compressor, cabinet (and plumbing if necessary) and lists all material that will be necessary to make the installation.

Information thus gathered by the inspector is returned to the foreman, including definite arrangements with the customer as to the time when the installation men will be permitted to do the work on the customer's premises. With the foreman's stamp of approval, the stock clerk routes the installations and lays out the exact material required for each job. The installation man, reporting in the morning, has only to take the materials laid out for him by the stock clerk the previous afternoon, goes to his jobs in the order called for and is sure of finding the customer at home to let him in, because of the appointment that was made by the inspector.

A service man checks each installation a couple of days after it is made. With machine installed, checked and inspected, a report goes to the main office from the warehouse and service shop giving time and material costs. The inspector examines each installation every 90 days. This plan, worked out by the manager of the refrigeration department, has proved very successful.

The merchandising organization of a company where the refrigerator salesmen, both domestic and commercial, have been separated from the general sales force is shown by Chart C. This is a locality of 90,000, and it will be noted that in this instance the superintendent of general merchandise sales also supervises the refrigeration business.

The method of organization of a company that operates in a number of comparatively small towns in a scattered territory is depicted in Chart D. This presents a problem that is confronting many central-station executives, particularly in the sparsely settled localities common to sections in the South, mid-West and West.

More than ever before it has come to be realized that efficient and at the same time economical sales and service organizations are required to handle the distribution of electrical refrigerators in the many companies that are operating a chain of properties and are directing their merchandising and commercial activities from a central point. A number of companies that have attempted to sell refrigerators under these conditions without foresight as to adequate organizations for selling, servicing and installing have come to grief. Others have been conservative to the point where they have made no attempt to study their problems and by so doing have greatly retarded the development of the electric refrigerator business in the localities they serve.

HANDLING SERVICE

Centralization of management, standardization of policies and co-ordination between sales and service departments, coupled with a thorough analysis of local problems, will help a utility company working under these conditions.

One utility company that has developed its service department to a high degree of efficiency has made up a standard kit of equipment that is taken by the service man whenever he goes out on a complaint or service call. The box which is illustrated measures 21¾x31½x12 in. and can be easily carried on a light commercial truck. The box is designed to carry two smaller compartment boxes nested within the main kit. One of these carries miscellaneous small supplies and may be conveniently carried inside the customer's premises. The material carried consists of the following supplies:

Six belts.
One compressor valve and plate.
One condenser shut-off valve and one suction shut-off valve.
One flat pulley and one V-pulley.
One drum of SO_2, 4 lb.
One expansion valve complete.
Three oil cans.
One spare thermostat.
One can glycerine and alcohol.
One can oil (½ gal.).
One spare thermostat cup.
One compressor discharge valve and one piston valve.

Table IX—Periodic Inspection of Electric Refrigerators

No. of Dealers	Frequency of Inspection	No. of Dealers	Frequency of Inspection
1	2 weeks	6	2 months
12	6 weeks	5	Quarterly
10	1 month	1	6 months

Closely related with installation and service is the matter of inspection of machines already installed. In this regard no standardization of inspection policies could be determined, because of the variety of practices now in use. Of the 34 dealers definitely maintaining periodic inspection, frequency varied from one to six months.

Table XI—Type of Installation for Domestic Electric Refrigeration Advocated

	East	South	Mid-West	West	Total
Total number of dealers expressing themselves	91	59	100	42	292
Remote	76	50	78	38	242
Self-contained	13	9	14	4	40
Either type of installation	2	0	8	..	10

Table X—Manufacturer's Service on Repairs as Viewed by Dealers

	East	South	Mid-West	West	Total
Number of dealers expressing themselves	99	39	106	60	30
Receiving good service	65	28	75	30	19
Receiving fair service	20	11	20	25	7
Receiving poor service	14	..	11	5	30

Table XII—Dealers' Opinion of Manufacturers' Discounts

	East	South	Mid-West	West	Total
Number of dealers expressing themselves	109	54	106	43	312
Discounts satisfactory	27	24	34	24	109
Discounts fair	53	30	46	14	143
Discounts too low	29	..	26	5	60

Prices are quoted to customers in several ways: A flat price installed where the freight, cost of handling and installation have been added to the factory list price; factory list plus a fixed installation charge plus also an additional charge if the compressor is to be remote from the box; factory list plus an installation charge regardless of whether the unit is to be remote or self-contained; list price plus an individual estimate for the cost of installation, including freight and handling. Installation charges vary with different dealers and machines, ranging from $15 to $60 added to the factory list price. Considerable additional wiring is required in some places, especially in those towns that have extraordinarily stringent requirements, such as putting motors on a separate circuit. In most localities, however, the refrigerator is connected to the regular lighting circuit and no difficulty has been experienced except, where house circuits are small, an occasional dimming of lights when the motor starts. A number of dealers are opposed to naming prices f.o.b. factory, as prospects dislike the additional charge to cover freight and installation after having formed a preconceived idea of the price.

Many conditions peculiar to the section of the country or to a particular central station or dealer have influenced the choice of method used in determining the price quoted to the customer. It is extremely important to commercial managers, in the rapid development of the refrigerator business, that accurate and complete records of freight, drayage, selling, installation and servicing costs be kept. It has been the experience of several companies after the first six months or a year to find that their refrigerator business is showing a balance on the wrong side of the ledger. This can be attributed as much to failure to keep adequate sales and service records as to the inherent cost of pioneering a new device.

Facing conditions as they are at present, there has been a larger percentage of cash sales of refrigerators than can be expected in the future, due to the concentrated sales efforts directed toward the better class of prospects. The problem of time payments is becoming more important as the market broadens to include more prospects. The results of this survey showed a variety of methods being used. The most typical were:

1. First payment of one-twenty-fifth selling price quoted, which includes installation charge. Balance paid in 24 months. Twelve per cent of unpaid balance added for carrying charges.

2. To responsible customers, $10 first payment. Twelve months to pay, with no carrying charge. If payments are extended more than twelve months, a 5 per cent carrying charge is made.

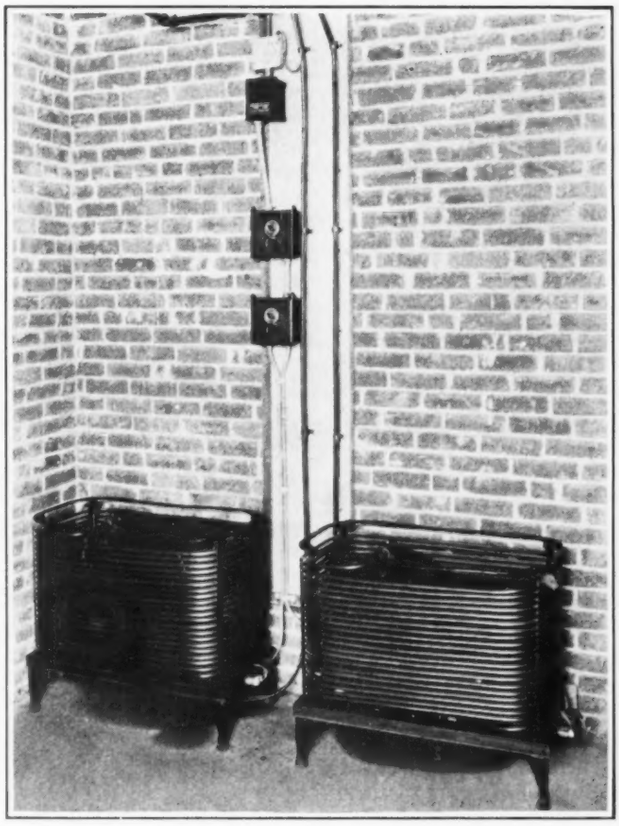
3. Free trial to reliable customers. Ten per cent of selling price (factory list plus freight plus installation) as down payment, with the balance in eleven equal payments added to monthly lighting bill. Five per cent added if payments are extended over a period of 23 months.

4. Thirty days' free trial. Thirty months to pay. Allowance of $5 to $100 for an old icebox.

5. First payment of 20 per cent of installed price with twelve to eighteen months' payment period, with proportionate carrying charges. Payment period extended to 24 months with no extra carrying charge during campaigns.

6. Twenty per cent down payment with twelve months to pay. Thirteen and one-half per cent charge for carrying account.

Although several of these methods are open to criticism, a summary of the length of time payments by refrigerator dealers shows a range from ten months to as long as 36 months. The most popular terms are from twelve to eighteen months. Whatever time is given for payment, it is the unanimous opinion of the successful dealers that a substantial first payment be made—at least enough to cover the cost of installation. The unsuccessful experiences of several commercial managers in giving too liberal free trials and payment periods may be taken as a warning that a definite amount of conservatism is needed in payment policies.



DUPLEX COMPRESSOR AND BOX INSTALLED IN A MASONIC HOME

A very limited number of dealers are giving cash discounts. The plan most common is to quote the installed price plus carrying charges, starting with the assumption that the sale is to be made on the installment plan. If, after the sale is closed, the customer wants to pay cash or the salesman convinces the customer that paying cash is more economical, a "cash discount"—the subtraction of the carrying charges originally added to the quoted price—is made.

Table VIII shows the trend in practice with regard to free service guarantees and charges for material and labor after expiration of the guarantee period. The most common free service guarantee now in use by both central stations and dealers selling electric refrigerators is for one year. With distributor-dealers, special dealers and most dealers other than the central stations, there is a tendency to reduce this year guarantee to three or six months. However, due to the newness and inexperience, it has become the custom to extend this guarantee longer than one year, even though it is not written in the bill of sale. The central station in particular is giving more liberal service than most other dealers.

Further, many dealers, in their desire to become firmly established in business, have disregarded or minimized charges for repairs and labor. The present tendency toward more liberal time payment terms has

Table XIII—Manufacturers' Sales Assistance, Advertising Assistance, Delivery of Units and Delivery of Repairs

	East				South				Mid-West				West				Totals			
	Total No. Dealer Expressions	Good	Fair	Poor	Total No. Dealer Expressions	Good	Fair	Poor	Total No. Dealer Expressions	Good	Fair	Poor	Total No. Dealer Expressions	Good	Fair	Poor	No. Dealer Expressions	Good	Fair	Poor
Sales assistance	102	48	39	15	55	28	25	2	107	45	46	16	36	18	13	5	300	139	123	38
Advertising assistance	106	50	39	17	58	31	25	2	106	46	41	19	38	17	19	2	308	144	124	40
Delivery of repairs	95	63	24	8	42	20	21	1	95	68	15	12	34	25	9	..	266	176	69	21
Delivery of units	110	82	16	12	46	21	22	3	112	84	18	10	40	29	5	6	308	216	61	31

served to lengthen free service to cover the deferred payment period.

A variety of methods is used in financing time payments. The power companies almost without exception are providing their own capital for this purpose. Out of 220 other dealers 81 are financing their time payments through the manufacturer and the remainder are using one of the following methods: Distributor, local bank, finance corporation (local or national), central-station company or themselves. The number using the manufacturer's financial plan appears smaller than might be expected, but this was explained by several dealers in the statement that use of the manufacturer's plan was too slow and expensive, as it usually required 60 days to get the money on the paper and it could be done better through some local finance company. Local facilities and financial resources of individual dealers have a great deal to do with the type of financing used. Considerable capital is required to carry on a successful electric refrigeration business, and manufacturers can relieve their dealers of a considerable financial burden by providing an effective service of this kind.

In the actual selling of electric refrigerators all dealers, and their salesmen as well, report that first cost is the principal and foremost sales resistance encountered. Anticipation of price reduction is closely related to the objection to first cost, but the latter overshadows all other excuses that prospects put forth for not buying now. Dealers also state that many people are unconvinced that the machines have attained mechanical perfection and are awaiting final development. A stock argument advanced on this score has been that "they will be cheaper and better next year." Little difficulty is being experienced, however, by the alert salesman, who meets this objection by pointing out to the user that if he waited for perfection before purchasing an automobile or a radio, he probably never would own either. Table VII shows the relative weight of these three points of sales resistance as expressed in the opinion of 306 users. There is no doubt that the satisfactory experience of users who have purchased refrigerators this year will go a long way by word-of-mouth advertising in convincing the public of the practical perfection of electric refrigeration. It seems likely too that prices should be pretty well stabilized by next year.

Another form of sales resistance noted by many dealers is the tactics employed by competitive salesmen in their zeal to sell their refrigerator against some other make. It is not the loss of the sale in such cases that worries the dealers, but criticism of other products succeeds only in creating doubt in the mind of the prospect of any kind of electric refrigerator. This is indeed poor salesmanship, and it appears almost too obvious to call attention to the destructive influence of such practices. One power company selling a certain make goes to the length of stating in its advertising that although it sells this machine, there are other makes being sold that will prove satisfactory, and these are named in the advertisement.

Need of greater education of the public to the value of refrigeration, and of electric refrigeration in particular, is pointed out as essential to the development of the market. A recent investigation revealed that only 32 per cent of the householders in a city of 300,000 use ice during any part of the year and only 12 per cent, or approximately one-third of these, use ice the year around.

RELATIONS AMONG LOCAL OUTLETS

The relations among dealers who sell competing machines are on the whole fairly satisfactory and although not perfect are improving as compared with the first intensity of selling when there was considerable bitterness and many accusations of unfair selling methods. There are price-cutting claims made, but where these have been found there is a strong suspicion that it is a case of the pot calling the kettle black and one dealer is about as much to be censured as another. Salesmen splitting commission with customers has been experienced in a few localities, but not often. Another form of price cutting has been excessive allowance on old ice-

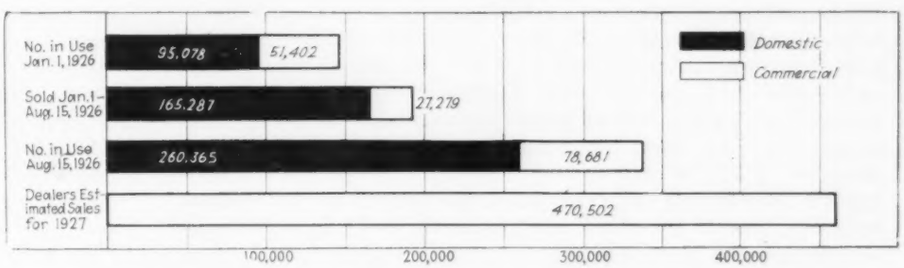
Table XIV—Reporting Editor's Impression of Competency of Electric Refrigerator Outlets

	East				South				Mid-West				West				Totals					
	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Per Cent	Fair	Per Cent	Poor	Per Cent
Organization																							
Central stations	33	17	9	7	29	6	14	9	44	23	14	7	15	1	11	3	121	47	38.8	48	39.7	26	21.5
All other dealers	95	34	40	21	46	9	29	8	79	24	39	16	47	14	20	13	267	81	30.3	128	48.3	58	21.4
Initiative																							
Central stations	33	17	12	4	29	12	13	4	44	27	14	3	15	7	5	3	121	63	52.1	44	36.4	14	11.5
All other dealers	97	44	34	19	45	17	21	7	73	40	18	15	47	23	17	7	262	124	47.3	80	30.5	58	22.2
Skill																							
Central stations	33	18	12	3	29	8	14	7	44	23	18	3	15	1	11	3	121	50	41.3	55	45.5	16	13.2
All other dealers	91	31	41	19	45	7	31	7	75	35	28	12	47	16	23	8	258	89	34.5	123	47.6	46	17.9

boxes taken in or else selling the refrigerator unit at the regular price and allowing a discount on the box where the dealer is selling refrigerator boxes of a different make than the compressor unit. In the larger cities, where apartment house installations make up a good share of the business, there is cause for complaint on the price concessions. Some dealers believe that no discounts should be allowed to builders or contractors, and the other extreme is represented by rock-bottom prices to get the business. It would be most desirable if a fairly uniform scale of discounts for quantity purchase could be set up. Of course, this involves the question also of how much servicing should go with such installations.

Unethical sales methods, mentioned previously as one of the contributory sales resistances, have cropped up from time to time, always of course with the finger of accusation pointing at the other fellow. All dealers themselves discountenance such practices and declare that they have instructed their salesmen to refrain from criticising the design of other makes or the kind of refrigerant or use of other questionable arguments. Most of such practices when they do occur are traceable to the salesman. For the most part, this kind of selling has been the exception rather than the rule, and during the progress of the investigation it was noticeable among different dealers that they scarcely mentioned troubles that competitive makes were experiencing. In fact, many dealers were so enthusiastic over the refrigerator they were handling that the survey reporter found it necessary to listen to a considerable amount of selling talk on that particular make before discussing the main object of his visit.

Comparatively little criticism of central-station company competition was heard, considering the number of utilities selling electric refrigtors and the aggressive methods pursued. Most dealers felt that the entrance of the local power company into the business had had a stabilizing effect and had served to build confidence in the public mind. Several distributor-dealers interviewed were anxious to see the local central-station companies increase their activities and expressed the opinion that if those companies that are not now selling electric refrigerators would do so, it would increase all dealers' sales in that locality. The complaints against the power companies' merchandising policies are about the same that have arisen before. Too liberal time payments, too much free service and taking advantage of its dominant position in the community to sell against other dealers were occasionally mentioned. These dealers have failed to take into consideration the value of the pioneering effort that the utilities are putting forth. On the other hand, central-station companies should not, because of their strong position, adopt policies that would actually work a hardship on other dealers.



ELECTRIC REFRIGERATORS SOLD THIS YEAR, THE NUMBER IN USE AND 1927 SALES ESTIMATES FOR THE ENTIRE COUNTRY BASED ON DEALERS' STATEMENTS IN 154 LOCALITIES EMBRACING 26.6 PER CENT OF THE TOTAL NUMBER OF DOMESTIC AND COMMERCIAL LIGHTING CUSTOMERS

SERVICING METHODS

Central-station companies, except those operating on the resale plan, have their own service departments. In some localities where the distributor is in the same town the power company works in conjunction with the distributor, the utility maintaining a small force of service men to make minor adjustments and answer emergency calls. General repair or major complaints are referred to the service department of the distributor or manufacturer's branch. At present this arrangement obtains chiefly because the utility has not been able to build its service department to the efficiency of the distributor's. In the few places where the resale plan is operative the distributor's service facilities have worked out very well. Other dealers, where it is available, have found it advantageous to use the distributors' service departments, but as these are usually located in the larger cities, only those dealers in the immediate vicinity can benefit. Naturally, most dealers of all kinds have of necessity trained at least one man for service work. One distributor operating in a city of 200,000 has extended his service facilities to cover a radius of 50 miles and declared that it was working out to the satisfaction of his dealers.

Power companies are building their service departments to operate independently of the distributor or manufacturer except for his assistance in training and developing service men. In a number of localities the central-station company is servicing the refrigerator sold by other dealers, and in the smaller towns this practice offers possibility of development into a centralized service organization for all makes under one head. Quick and effective service is a highly important item, and future sales may depend largely upon the quality of service that is given on the first few hundred thousand units installed.

Training installation and service men has been a matter of deep concern to the utilities, distributors and manufacturers. Both manufacturers and distributors have performed a service for the industry in providing training courses for service men and salesmen at the factories, distribution centers and on the local properties. Central-station companies have had their men take the courses, which vary from three days to two weeks, some men going back for a second time. In one or two cases power companies have thought special training unnecessary and about the only experience the installation and service men had was a few hours with a factory man who made the first installation, left a few instructions and went on his way. Needless to say, these service men feel that they know little about the design or operation of the machine. Two weeks would appear to be the minimum training period and even longer might be desirable. Factory training has proved much more effective than local courses. What the training courses cannot hope to give is actual installation and

service experience in the field, and the more successful companies are having newly trained men serve as helpers for three months to acquire the necessary experience. Much depends upon a man's original mechanical ability, and it is also most desirable that he understand the fundamental principles of refrigeration. In the opinion of a distributor-dealer who has been in business for six years, it takes three years to make what he would call an "expert" refrigerator man.

Little uniformity was found in the number of service men required per thousand units in use. One distributor who stated that there were 7,000 units of that make in use in the locality employs but four service men, which he declared was ample. Some installations have been operating, he said, for five years without a single service call. The most uniformity was found among the power companies, several of which have adopted the practice of providing one service man for from 300 to 400 machines. One company that has sold 750 units has two service men and will add one for each 300 machines installed.

SERVICING EXPERIENCE

The servicing experiences of central-station and other outlets have proved to be the most checkered and contrasting element of the whole survey. They range from a highly satisfactory condition where service calls are scarcely known to such serious difficulties that the power companies or dealers have completely stopped the sale of electric refrigerating units. Nor are the difficult situations confined to any one make of refrigerator, as the same make that has caused endless trouble in one locality has been found to be giving well-nigh perfect satisfaction in another. The survey has emphasized an astonishing lack of data on service costs. Power companies, distributors and manufacturers should take immediate steps, if they have not already done so, to set up some means of recording the nature, frequency and cost of service calls. It is badly needed as a guide to installation and servicing practices and will serve as the best means of detecting weaknesses in design and construction.

Figures on the yearly cost of servicing per unit were not available with any degree of accuracy except in a very few instances. They varied all the way from nothing to as high as $35 or more, as announced by a badly disgruntled oil burner dealer. A distributor-dealer who has about 2,500 domestic units installed in his immediate territory quoted a figure of $2.34 per unit per year. This summer he had four service and ten installation men at work. A central-station company with 349 domestic units in operation had a total of 225 service calls from June, 1925, to June, 1926, with an average cost per call of $6.25. Of these units 244 had required absolutely no attention. A utility with 221 machines in service over a period of twelve and one-half months answered a total of 757 service calls—an average of $3.29 per unit. The cost per machine-year was $13.27. One utility believes that the refrigerators on its lines require about three service calls per year and to cover these has set aside $10 per machine.

Service costs are excessive in some cases, but the low figures given in several localities show that the yearly cost per unit should not be more than $5 maximum and that costs as low as $2.50 to $3 per unit per year can be attained.

Closely related with installation and service is the inspection of machines in use. Nearly all dealers make a practice of having service men call back on new installations from two to four times to be sure that they are operating properly. After that an inspection call is made every six weeks, and there was one instance of a dealer who makes regular calls every two weeks. Table IX shows the practice of 35 dealers whose frequency of inspection varied from two weeks to six months. Because of the newness of electric refrigeration and the well-known tendency of domestic customers to pay little attention to oiling or giving much if any care to electrical appliances, it would be desirable if all dealers would establish a practice of making either quarterly or semi-annual inspections. This, perhaps, need not extend indefinitely, but it is a precautionary measure that could well be taken during the next year or two.

MOST FREQUENT CAUSE OF COMPLAINTS

Various complaints were cited, some being peculiar to particular makes of refrigerators. They have been tabulated according to the nature of the complaint which the central-station company or dealer named as occurring most frequently or had proved the most troublesome. In order of their importance and frequency for the 28 different makes they were as follows: Leaks, float valves, odors, thermostat, expansion valve, belt, adjustment and general regulation, poor factory inspection, temperature control or regulator, noise, general poor operation, pulley, warping doors. Others mentioned less frequently were sweating boxes, mercury switch, sticky valves, stuck compressor, poor paint or enamel, blind gaskets. Virtually no electrical trouble was reported. Although poor factory inspection is rated eighth as a cause for complaint, many companies and their service men stated that the direct cause of many service calls was traceable to careless assembly and lack of inspection at the factory. Another cause contributing to increasing the number of service calls and their cost has been hasty or careless installation work.

Outstanding in nearly every instance has been the importance of careful installation and conscientious factory inspection in the elimination of complaints. It has been repeatedly stated that 95 per cent of the complaints can be attributed directly to one or both of these causes rather than inherently poor designs or bad mechanical construction.

The solution of the servicing problem lies in better and more complete training of installation and service men, scrupulous care in making installations and most rigid inspection and testing of units before they leave the factory. It should be said to the credit of the manufacturers that where their product has given trouble and the difficulty was recognized as due to poor workmanship or superficial inspection, the manufacturers have wholeheartedly accepted their responsibility and spared neither effort nor money to replace faulty units or put them in proper operating condition. Table X shows that the majority of dealers consider that the manufacturer's repair service has been satisfactory and only 30 dealers out of 304 had experienced difficulty in this respect.

REMOTE OR SELF-CONTAINED UNITS

Where conditions are suitable, nearly all dealers prefer to install the compressor unit either in the basement or at some point away from the box. The advantages of the remote installation are usually

enumerated as elimination of noise, higher efficiency because of better circulation of air and lower surrounding temperature, greater accessibility for inspection or service and less likelihood of tampering by the user. In some localities where houses have no cellars it has been the practice to install compressors on the back porch. Back-porch installations of box and compressor have been discouraged in the Northwest because during the winter months some machines would not run long enough to freeze ice cubes. Of 292 dealers, 242 advocated the remote compressor, 40 favored the self-contained unit and ten had no preference.

Although there is a strong inclination toward the remote compressor, there are certain limitations to its application. It usually costs from $10 to $25 more to install than a self-contained unit. The self-contained unit has been found easier to sell, particularly to people who rent their homes. In apartment houses the installation of individual remote compressor units is often difficult. Remote installations are fixed and permanent, whereas the self-contained unit can be moved about readily. Whether or not an installation is to be remote or self-contained depends largely upon local conditions, but the prospect should be fully acquainted with the advantages of both, as there are numerous instances where it has been necessary to remove the compressor from the bottom of the box and place it in the basement. Dealers generally have criticised the national advertising by manufacturers that has featured the self-contained unit where 80 per cent of the installations are made with remote compressors. In the self-contained unit locating the compressor and condensing coils in the bottom of the box makes a very neat appearing cabinet, but because of better ventilation and accessibility, placing the unit on top has its advantages. There is a considerable demand for a small self-contained unit at an installed price under $200, which can be sold to apartment dwellers and to people of more moderate incomes.

PORTABLE TOOL BOX AND KIT USED BY REFRIGERATOR SERVICE MEN

MANUFACTURER-DISTRIBUTOR-DEALER RELATIONS

Practices, policies and relations from the manufacturer to the dealer have as yet to be worked out to the satisfaction of every one concerned. There are several weaknesses in the chain of distribution. The ever-present question of discount or lack of it is uppermost in the minds of many retail outlets. There are many factors, such as manufacturer's or distributor's sales, advertising, installation and service assistance, which act as variables in the discount received by dealers. A study of the key tabulation shows that discounts range from as low as 10 per cent to dealers acting merely as agents to as high as 45 per cent quoted by a department store, which is one of two such types of dealers that has made a real success in the sale of electric refrigeration. Table XII gives a general idea of the attitude of retail outlets toward the discounts they are receiving. From this it will be seen that a little more than one-third consider the discount satisfactory or "good"; almost one-half of the dealers viewed their discount as "fair" or qualified it with the statement that they were about breaking even or as yet there is no profit in the business, and about one-fifth emphatically declared that the discount was too low.

Among central-station companies there was almost unanimous opinion that so far there has been no merchandising profit, but this is accepted as part of the pioneering cost. Power companies felt that where they carry stocks, do all the selling, advertising, installation and servicing, a discount of 40 per cent is the minimum and 5 per cent more would be desirable. Other power companies operating on a 30 per cent discount but receiving considerable free sales, advertising and service assistance from the manufacturer or his distributor find that this assistance compensates for the smaller discount. There are a number of variations from these two, depending upon the set-up as to sales and servicing.

Other retail outlets, special dealers, electrical contractors and department and hardware stores were more inclined to view their discounts of 20 to 33 per cent, which they quoted, as too low. Such complaints were usually amplified, however, with further criticism of the manufacturers or distributors because of delayed shipments of repair parts or what the dealer considered inadequate sales and servicing assistance. Shipment of units or repair parts on a C.O.D. basis has been criticised by central-station and all other dealers.

Many dealers are also averse to paying anything for advertising material supplied by the manufacturer. There is need for education of dealers to enable them to get the most benefit out of the newspaper advertising and literature supplied by the manufacturer, part of the cost of which is passed on to the local dealer. Taken as a whole, discounts are none too liberal and might be increased in some places. It is of equal importance, though, that there should be a closer contact of the retail outlet with the manufacturer or his distributor. Efficient organization for sales, service and shipment are paramount considerations in creating satisfactory relations from manufacturer through to the ultimate user.

Sales and advertising assistance rendered each selling outlet by the manufacturers and delivery of units and repairs have an important bearing upon the relations between dealers and manufacturers. Accordingly, emphasis was given to obtaining expressions on these

items from the local selling outlets. In fairness to the manufacturers it should be noted that it was sometimes necessary to discount the statements of retail sales representatives because of exaggeration. Of 300 dealers, 139, or less than 50 per cent, qualified the manufacturers' sales assistance as good. On the other hand only 38, or about 12 per cent, were of the opinion that the manufacturer's, distributor's or factory branch's sales assistance was poor. This classification shows room for improvement on the part of the manufacturer.

The sales assistances given by the manufacturers and found most helpful are: Training salesmen, organization of special refrigerating departments, supplying sales manuals, demonstration helps, standard equipment specifications, sales stimulators, prizes, suggestions for sales meetings, frequent visits by specialized factory and territorial sales managers, co-operation during campaigns, help in campaigns, store and window displays, and methods of co-ordination of sales, installation and service departments.

Again referring to Table XIII, it can be seen that less than 50 per cent of the dealers declared that they were receiving good advertising assistance, whereas 13 per cent emphatically stated that the advertising assistance given them was poor. Although some of the demands by the dealers were excessive in proportion to their importance as sales outlets, there were found to be considerable grounds for improvement on the part of the manufacturer.

Table XV—Electric Refrigerator Dealers' Sales Estimates for 1927 in 154 Localities

Section	No. of Localities Analyzed	No. of Central Stations Selling Refrigerators	Central-Station Estimate	Estimate of All Other Dealers	Total	Central-Station per Cent of Total
East	41	34	10,700	28,660	39,360	27.2
South	36	29	8,810	16,550	25,360	34.6
Mid-West	52	46	12,515	35,975	48,490	25.9
West	25	15	3,260	8,550	11,810	27.6
Total	154	124	35,285	89,735	125,020	28.1

Varying to considerable degree for different localities in the country, the delivery of units and repairs deserves no small amount of thought, especially at this time, which in the opinion of many is the critical period in the development of electric refrigeration for the manufacturer, the central station, the dealers and the public. With 70 per cent of the dealers declaring that they were obtaining good delivery on units and only 10 per cent believing that their deliveries were poor, a marked improvement on the part of the manufacturer is seen in comparison with conditions earlier in the year. In the light of improved production methods and increased manufacturing facilities now under way, there is every reason to believe that in 1927 there will be very few dealers postponing campaigns or receiving cancellations from customers because of failure to receive shipments.

Although the delivery of repairs has not reached the point where the dealers are unanimous in stating that they are getting prompt service, conditions are much better than in the past and show marked signs of improvement.

A better understanding of Table XIV will be conveyed by describing the interpretation of the three terms—organization, initiative and skill—as follows: By organization is meant the advertising, sales, installation and service set-up of the dealer at the time of the editor's interview. By initiative is meant the attitude toward the refrigeration business and the enthusiasm to develop a successful organization with the momentum obviously existing. By skill is meant the efficiency and ability to sell and service refrigerators as manifested at the time of the interview. A dealer or central station just starting in the business, with no previous experience, was not considered as skilled in refrigerator selling or servicing.

Each of these qualifications of the refrigerator outlets has been rated as good, fair or poor; the central station has been compared with all other dealers in each of the four geographical sections of the country considered throughout this survey; finally, the classifications have been totaled for the country and corresponding percentages figured.

Although the central-station companies lead in the percentage of outlets having good organizations, there is a smaller percentage of utilities with a fair organization and the same percentage with poor organizations as have all other dealers. In other comparisons of initiative and skill the percentages favor the central-station companies.

As previously mentioned, taking into consideration the length of time the majority of central stations have been active in electric refrigerator merchandising, in comparison with that of many other dealers, their accomplishment is remarkable.

General Situation with Respect to Past Conditions

A picture of the general situation with respect to the electric refrigeration industry for the country shows that conditions are improving; however, by studying the key tabulation, it will be seen that there are localities in each section where conditions are improving too slowly, are not improving at all or are even on the decline.

A study of the number of domestic and commercial electric refrigerators in use in the 154 localities analyzed in Table I reveals that for the country as a whole a saturation of only 1.78 per cent of domestic customers had been reached as of Aug. 15, 1926. Further analysis shows that some sections of the country have gone ahead much faster than others in the development of electric refrigeration; as, for instance, the South has the highest saturation, which may be partly attributed to the generally higher temperatures and the greater consequential demand for refrigeration. The principal reason for the good showing made in the South has been the generally good sales organizations built up by the central-station companies and the relatively large number of them actively engaged in the sale of electric refrigeration. They are working in close association with the manufacturers and distributors and the effect of this co-operation is being shown in sales volume.

In the West, where saturation of domestic customers is 1.15 per cent, development has been slower. Fewer power companies are active in selling electric refrigerations, and what might be classed as good utility sales organizations were the exception rather than the rule. Climatic conditions, particularly in the Northwest, probably have had some effect, but the support and influence of the power companies' selling are lacking. This condition was commented on frequently by distributors and retail dealers, and the wish was expressed that the local utilities would take a more active part.

Saturation in the East and Middle West is affected by the high proportion of renters in the larger population centers, where most of the selling has been done in the suburban areas and in equipping apartment buildings.

ENERGY CONSUMPTION

The kilowatt-hour consumption of domestic units ranges from a low point of 450 kw.-hr. per unit per year in the Middle West to a maximum of 1,200 kw.-hr. per unit per year in the South. The variations were approximately proportional to the size of the unit and the temperature prevailing in the locality. Little data were available on the consumption of commercial units, some companies stating that a commercial installation returned about twice the revenue of a domestic installation. Power companies have found that installation of the domestic refrigerator can be counted on to double the revenue received from a residential customer. Cost of energy to operate electric refrigerators has not seriously affected sales, but the need for uniformity in rate structures and a type rate that will encourage use has again been emphasized.

MARKET POSSIBILITIES AND SALES ESTIMATES

In the opinion of utility executives the present market for domestic electric refrigeration is from 10 to 30 per cent of the residential customers. It is significant to note that family income cannot be taken as a hard and fast criterion of a customer's ability or inclination to purchase an electric refrigerator. It is an important element in a market survey, but many companies that have arbitrarily set up a prospective list of customers with incomes of $5,000 or more have had their calculations upset by sales to a number of customers with incomes of less than half that figure. It is also a mistake to judge the number of potential purchases by the percentage of homes now using ice. There will always be a large field for ice refrigeration, and much will depend upon education of the public to the use of ice as well as electric refrigeration.

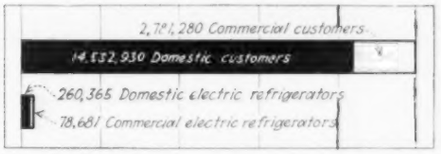
Considering that 30 per cent of the domestic customers may be regarded as legitimate prospects for electric refrigeration would mean that there is in the United States today a possible market for about 4,500,000 units. It is a question how many years would be required to reach a 30 per cent saturation, entirely disregarding the number of new customers that will be added from year to year. The existing sales, installation and service organizations will this year sell close to 250,000 domestic and commercial units, but at that rate would require eighteen years to sell 4,500,000 units. Dealers of all classes are increasing their sales forces and the estimated sales for 1927 by all dealers as shown in Table XV for 154 localities is 125,020. This is about two and a half times the number of units sold during the first seven and one-half months of 1926. Based on the estimates of these dealers, the existing dealers in the whole country expected to sell a total of 470,502 units in 1927. Of this number the estimates show that about 28 per cent will be commercial and 72 per cent domestic. This figure does not take into account the appointment of additional new dealers or the entrance of power companies not now selling electric refrigerators but which have expressed the intention of organizing for their sale. What next year's total sales will be depends upon the extent to which manufacturers, distributors and retail outlets can expand their sales, installation and service organizations. These must be recognized as the neck of the bottle through which manufacturers' production must be squeezed. It should be comparatively easy in 1927 for all outlets to sell at least 500,000 units. Actual sales will probably reach 750,000, and unless some unexpected condition arises such as a business depression or there is a recurrence of delayed shipments and extraordinary servicing requirements the latter figure may be exceeded.

CONCLUSIONS OF SURVEY

Summarizing conditions and trends resulting from an analysis of the tabulated reports and weighing the opinions expressed by utility executives, distributors and all the selling outlets interviewed, the following conclusions with some suggestions can be made:

1. Electric refrigeration as a practicable and satisfactory service to the home has definitely arrived. There are a number of high-class machines now on the market that the central-station company can conscientiously recommend and sell to its domestic customers.

2. Utility executives are well convinced of the value of this load and regardless of the factors that have influenced local situations such as non-merchandising policies or conservatism toward the new development central-station companies should take immediate steps to promote the sale of electric refrigeration in its territory either by the organization of a special refrigeration sales and service department or more effective co-operation with local outlets. Sales programs for 1927 should be completely mapped out before the end of this year.



SATURATION OF DOMESTIC CUSTOMERS IS 1.78 PER CENT AND FOR COMMERCIAL CUSTOMERS 2.88 PER CENT

3. Central-station companies are the best existing retail outlets for a number of reasons: They are vitally interested in the development of electric refrigeration; they have sales and service departments that lend themselves readily to the business; they have a large prospect list ready made in their domestic customers; they can finance their own time payment paper, and they are a strong influence in recommending a new service to the public.

4. So far as can be ascertained, the ice industry has not actually suffered by the advent of electric refrigeration. Central-station executives as a whole have met the ice manufacturer problem openly. Little or no trouble has developed where the utility and the ice companies have got together and talked things over. Avoidance of the issue usually aggravates the situation, which should be ironed out at the start. There are indications that progressive ice dealers are slowly coming into the sales picture.

5. Commercial refrigeration is separate and distinct from the domestic field. It is being handled largely by manufacturers' branches and specialists but offers a large field for development by special commercial refrigerator salesmen. More thorough engineering of small commercial installations is needed and in cities large enough to offer sufficient market the central station should have at least one man solely for commercial work.

6. Simplification of refrigerator equipment is important, including the reduction of piping joints. Accessibility for inspection, repair and oiling will tend to reduce the number and cost of service calls.

7. Thorough factory construction is vital to satisfactory operation in service. Every machine should pass a rigid inspection, including a running test, before leaving the factory, even if it requires some sacrifice in quantity production. Quality should not be sacrificed for production.

8. Careless or hasty installation work results only in multiplying complaints. Proper installation will eliminate the majority of complaints, and a little more time spent on this work pays big dividends in reducing subsequent service cost. The right kind of installation work has been found to be the answer to 95 per cent of the complaints.

9. A first-class service organization is essential. Electric refrigeration is still on trial in the public mind, and the future of the business may depend upon the quality of service rendered during the next year or two. This does not necessarily mean free service, but good service, even if charged for after a stated period.

Table XVI—Dealers' Sales Estimates for Entire Country for 1927 Based on Ratio in 154 Localities

Section	Total Number of Customers	Total Number of Refrigerators Central Station	All Other Dealers	Total
East	5,802,330	45,026	120,688	165,714
South	2,178,170	34,079	63,820	97,899
Mid-West	6,343,500	41,233	118,623	159,856
West	2,990,021	12,947	34,086	47,033
Total	17,314,210	133,285	337,217	470,502

Table XVII—Domestic and Commercial Electric Refrigerator Sales by All Classes of Dealers for the Entire Country Based on Ratio in 154 Localities, Jan. 1 to Aug. 15, 1926

	East	South	Mid-West	West	Total
Domestic refrigerators	60,041	23,751	62,587	18,908	165,287
Commercial refrigerators	5,494	5,929	12,324	3,542	27,279
Total sales for seven and one-half months, 1926.	65,535	29,680	74,911	22,450	192,566

10. Guarantee periods, including free service, range from three to fifteen months. There is a tendency on the part of manufacturers' branches to shorten the free service period to three or six months, whereas the guarantee on defective parts runs for a year. Central-station companies are generally extending the free service for longer than a year, and where long term payments are offered service is usually extended to cover the period of the payments.

11. Service costs are too high, in many cases running from $12 to $15 per unit per year. This has been caused by a combination of circumstances—inexperience in making installations, inexperienced service men, poor factory inspection. Service cost should not exceed $5 per unit per year, and $2.50 to $3 is attainable. The cost per unit will decrease as saturation increases. Some distributors are handling service calls with one service man for every 1,000 domestic units installed. Central-station companies are finding that one service man can take care of the service work on 300 to 500 units. A compact or a scattered territory is a determining factor.

12. Training for service and installation men has generally been inadequate. One or two weeks is too little. Two weeks' or a month's training with two or three months' work as helper is required to make a first-class installation or service man, provided he has an aptitude for the work. Manufacturers' training schools conducted at the factory are much more effective than training courses conducted at the local utility.

13. Many service calls are unnecessary and often result from failure of salesman or installation man to explain the operation of the unit to the customer. Overselling by salesmen with respect to time required to freeze ice or method of making frozen desserts results in disappointed users who expect impossible performance. Proper selling in the first place and tactful servicing of such complaints cannot be urged too strongly. In the majority of cases service calls drop off sharply after the first month's use when the customer has become familiar with the refrigerator.

14. Periodic inspection every month or six weeks after a unit is installed is made by a number of dealers. This is a commendable practice, particularly at this time. However, if continued, it will impose a heavy burden upon service departments. Quarterly or semi-annual inspections should be sufficient, and some companies are considering the possibility of offering users a flat charge per year for maintenance after expiration of free service period, if they can determine a fair figure for this work.

15. Accurate data on number of service calls and costs are woefully lacking. Power companies and also dealers should set up some method of keeping service records in order to guide them in service practice and with a view to offering customers an inspection and maintenance service at a nominal charge.

16. Central-station companies and dealers who are setting up systematic sales and service organizations are getting the best results. Hit-or-miss methods result in chaos, disappointment in sales volume, dissatisfied and disgruntled customers, and high sales and service costs. Selling electric refrigeration is a highly specialized business and should be conducted by a special department further subdivided as to domestic and commercial sales. Use of special refrigeration salesmen by the central-station company is to be preferred to using the general sales forces, which tends to detract from other commercial activities. Continuous selling in so far as the seasonal nature of the business will permit is most desirable in order to retain an efficient year round selling organization and flatten out the sales curve. Campaigns have proved effective in stimulating sales, but tend to put too heavy a load on the installation department, and some companies have found that campaigns have caused them to undershoot their total sales quotas for the year.

17. High-type specialized salesmen are required, and men of some maturity are better than youthful salesmen. Compensation should be fair and liberal, always with the knowledge that low salaries or inadequate commissions beget poor salesmanship. Electric refrigerator selling is a man's job and requires a lot of intelligence and stamina. One to four weeks' training of salesmen is desirable, and it takes from one to three months for a new man to hit his stride.

18. Much of the electric refrigerator business to date has been on a cash basis, but the past summer has seen a wide adoption of time payment plans. Terms extending over 24 and even 36 months have been offered, but

too liberal terms may have a bad reaction later in view of price reduction and new models. Twelve months would be more desirable; however, 18 to 24 months fits in better with the family budget.

19. Principal sales resistances encountered in order of their frequency were first cost, doubt of final development and expectation of further price reductions. Some utility companies are awaiting stabilization of prices and conviction that present design is fundamentally correct. Electric refrigerator manufacturers should consider these elements and their effect upon the market.

20. Income limitations of prospects do not entirely control the market. It is not an important consideration now when the very top of the cream is being skimmed, because reports indicate that at least 20 to 30 per cent of domestic customers may be considered as legitimate prospects. The wealthier classes have not proved as good prospects as people of smaller incomes. This has been surprising and calls for a different kind of selling.

21. Trial installations to stimulate sales are anathema to many agencies, which maintain that this is weak selling. Experience has shown that when this is done cautiously only 6 per cent of the trial units had to be removed. Where due consideration is given to customers' responsibility and conscientiousness of salesmen, the trial period is a valuable sales argument but cannot be offered indiscriminately.

22. Price cutting is a two-edged sword and once started in a locality has a cumulative and increasingly bad effect upon all dealers. Co-operative associations of refrigerator dealers have helped this situation in some cities. There is plenty of business for all, and they would do well to adopt a standard code of ethics and practice. Accepting old boxes as trade-ins is practicable only in communities where they can be sold to the poorer classes that do not now use ice. This can be used as a means of extending the ice manufacturers' business. Excessive allowance on old boxes to close sales is a pernicious form of price cutting and detrimental to the electric refrigerator business.

23. Distributors and dealers claim to have made little or no profit this year. There is a wide demand for better discounts, and 40 per cent off list is thought to be about right where machines are purchased, stocked, handled, sold and serviced by the retail outlet. Manufacturers rightfully point out that electric refrigerators are not "shelf merchandise" and dealers can expect to make real money only through sales volume. It was most noticeable during the course of the investigation that those dealers that were the most aggressive and that were making the most intelligent use of the manufacturers' sales assistance were making the most sales and had the least complaint to make on discounts.

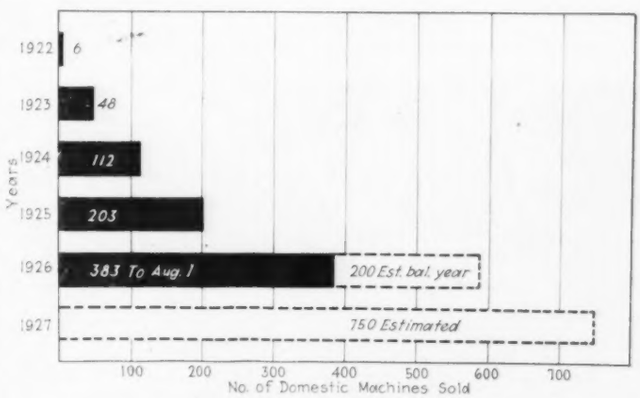
24. C.O.D. shipments of units and repair parts rankle many responsible dealers in addition to working a financial hardship at times. Selling electric refrigerators requires considerable capital, and manufacturers should endeavor to appoint dealers for whom these terms would not be difficult or whom the manufacturer would be willing to carry for a period of 30 days at least. Closer co-operation between the dealer and manufacturer's branch in the use of sales assistance would go a long way toward eradicating discussion of this item.

25. Better shipments of units by the manufacturers and more prompt attention to shipment of repair parts and calls for service assistance are wanted by dealers. This situation, however, already shows marked improvement all along the line.

26. Retail dealers should give more attention to the location of their stores as well as the appearance of windows and sales floors. Side streets and untidy shops do not accord with the sale of a product the major selling points of which are cleanliness and the hygienic preservation of foodstuff.

27. Distributor-dealers, central-station companies, special or exclusive dealers and electrical contractors have proved the best outlets for the electric refrigerator. It is not yet ready for distribution through already established channels such as department, furniture or hardware dealers. Resale plans being formulated by some manufacturers may be attractive to this class of merchants.

28. Naming prices f.o.b. factory has caused bad reactions and hampered sales, but it seems impossible to suggest a better method that would be equitable to every one concerned. In this connection it is believed



YEARLY SALES DOMESTIC ELECTRIC REFRIGERATORS BY ONE CENTRAL-STATION COMPANY

by dealers that national advertising has sold the idea of electric refrigeration better than local newspaper advertising, which can be accounted for by many dealers' failure to accept the manufacturer's plan for local advertising.

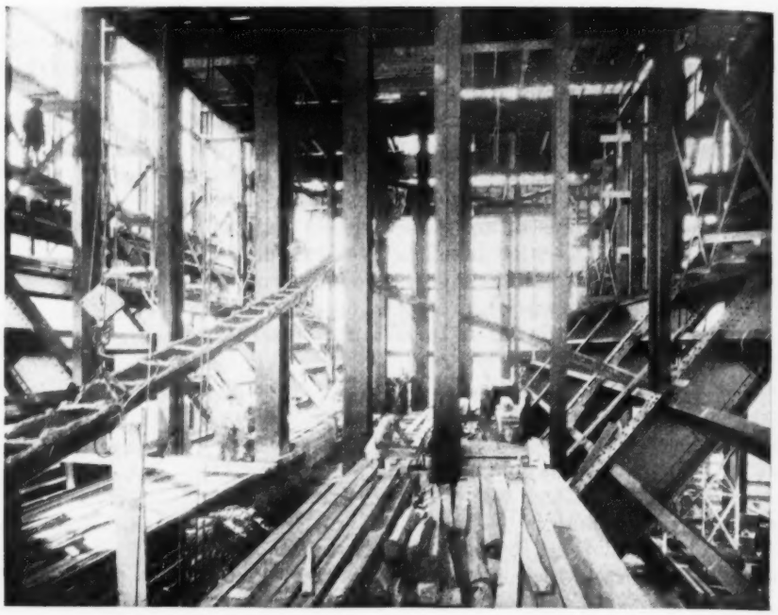
29. Remote installations are preferred by most dealers, who state that national advertising should not feature self-contained cabinets so heavily. There are limitations to remote installations, and the self-contained unit has a big field in apartment houses, for renters and people who insist on being able to move their refrigerator about. There is also a demand for a small, low-priced, self-contained unit.

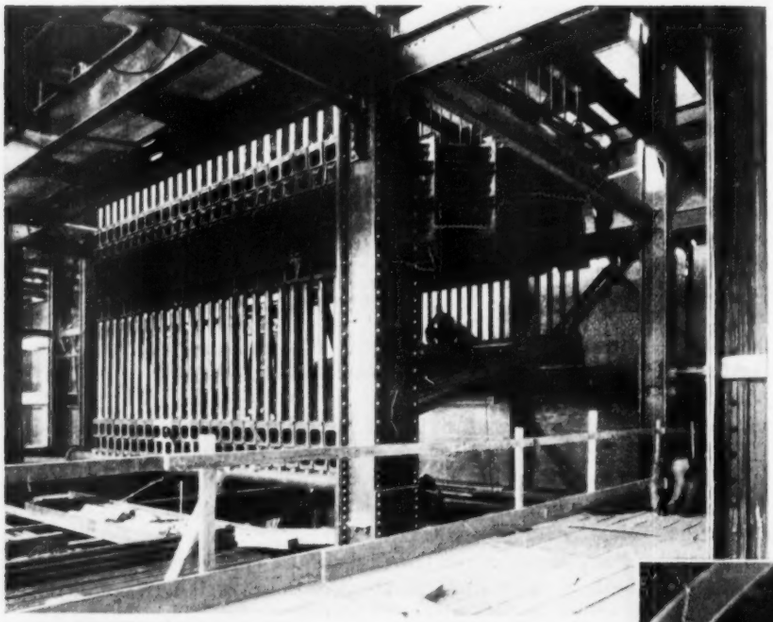
30. The ice cream cabinet business has gravitated toward the dairy and ice cream wholesalers. Where they are not providing this service to their customers, it presents a profitable market.

31. Electric rates for refrigeration service have not influenced sales, but dealers should refrain from comparing rates effective in different localities. The need for uniform rate structures designed to encourage use is again apparent. It is generally believed that the rate per kilowatt-hour should not exceed 6 or 6½ cents and that 5 cents is about right.

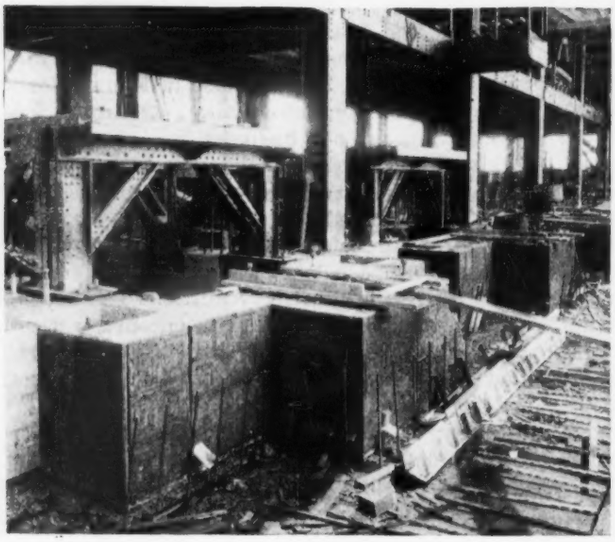
32. The public generally has accepted electric refrigeration, but wants to be shown, and sales next year will be governed pretty much by the capability and capacity of the sales organizations that can be made effective.

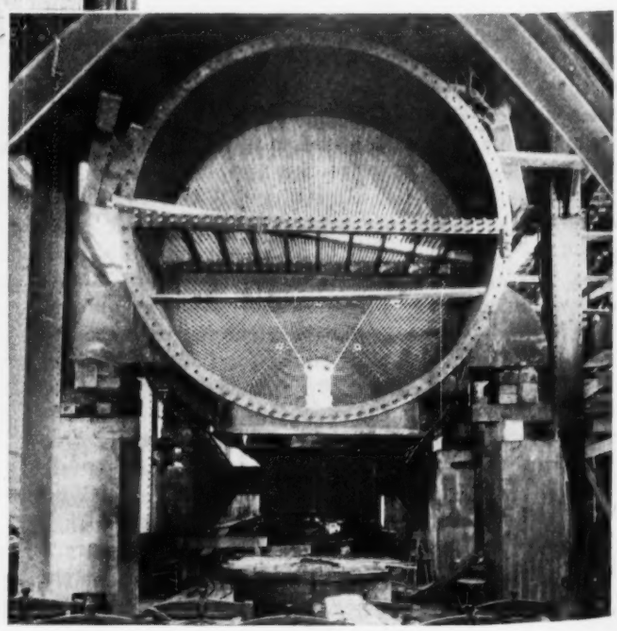
East River Station During Construction



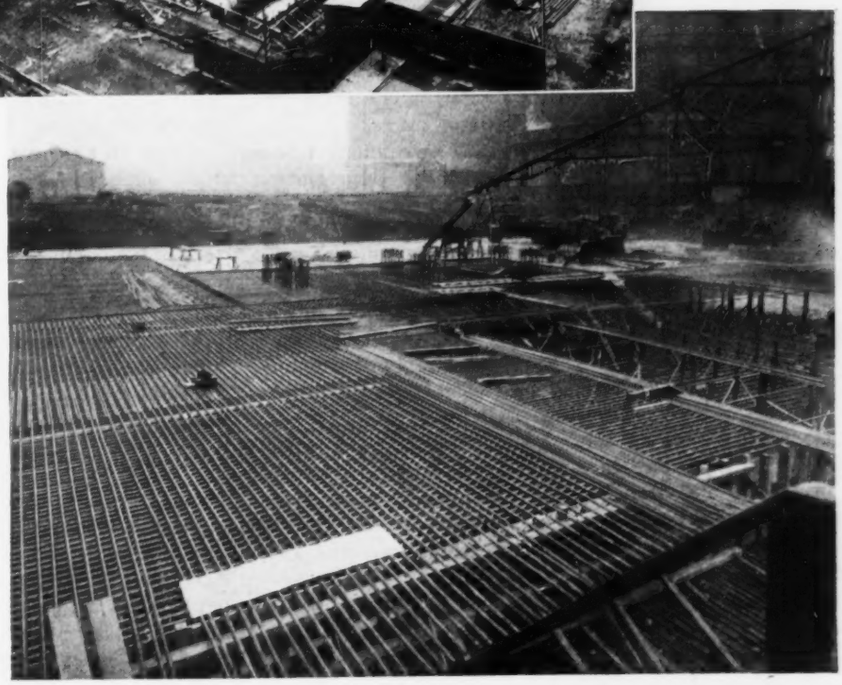


STEEL construction of the coal bunkers in the pulverized-fuel plant of New York Edison's new East River station is shown above. At the left is a tube deck of one of the 1,550-hp. boilers which will produce steam at 375 lb. and 700 deg. Fahr. Interdeck superheaters will be used. The four walls of the furnaces will be faced with steel water tubes to permit the use of high-combustion chamber temperatures without wall deterioration. In the lower left corner are foundations for the coal pulverizers, surrounded with cork to prevent transmission of vibration to building. Below is one of the 47,000-sq.ft. condensers to be used with 60,000-kw. turbo-generators.





Foundation Construction at the East River Station



ELEVEN HUNDRED piles could be driven from one position of the pile-driver traveler at the East River station of the New York Edison Company. The travelers were mounted on 44-ft. tracks. In the center view of the foundation can be seen the 6-ft. cast-iron condenser circulating water pipes, which are a feature of this station. These individual intake and discharge pipes for each condenser's cooling water are intended to permit flexibility of operation not afforded by the customary construction. Below are shown reinforcing rods laid ready for pouring the concrete foundation of the station.

Ripley Urges Investigation of Utilities

Harvard Professor of Economics Makes Analysis of Financial Operations of Power and Light Companies—Asks Immediate Examination of the Whole Field by the Federal Government

"MORE Light—and Power Too" is the curt and rather noncommittal caption under which appears in the November issue of *Atlantic Monthly* a very searching analysis of the public utility industry in the United States. Without mincing words, William Z. Ripley, professor of economics at Harvard University, charges the industry with the practice of certain unethical and decidedly dangerous policies and suggests methods to curb these practices.

Following a somewhat similar attack in the same magazine a few months ago on the alleged abuse of non-voting stock and the obscurity of financial statements, the current article deals with various phases of financial reorganization, especially in the light and power industries, demanding an immediate federal investigation of the whole field.

Admitting the manifest advantages of legitimate concentration of capital, both from an operating and from a financial viewpoint, Professor Ripley charges the industry with violation of certain more or less established financial principles. These principles are concerned with the following practices:

1. The pyramiding of control through loading ownership with non-voting stock.
2. Closing of the open market to new issues through single banking affiliations.
3. Payment of parent company dividends when subsidiary dividends are in arrears.
4. Deliberate obfuscation of reports—publishing one set of figures for shareholders' consumption and another for stock exchange purposes.
5. Paying dividends on the basis of future profits, resulting sometimes in vanishing returns.
6. Capitalizing companies out of all proportion to existing equities.
7. Paying holding-company dividends on the basis of profits from financial operations such as the issue and sale of stock for subsidiaries.
8. Issuing new securities for new equipment where allowance from earnings in the form of depreciation and replacement reserves should have been made.

In fairness to the industry, Professor Ripley commences with the admission that the present state of centralization of control and the alleged maze of interrelations of companies out of which arise most of the abuses charged are due largely to the diversity of state laws—an outcome of the federal system of government. "Corporations are oftentimes compelled by the diversity of state laws to resort to these artificial arrangements—albeit perhaps not without a modicum of quiet satisfaction that our conflicts of laws are so badly permissive of profitable indirection." Certain privileges which do not exist in the home state of the corporation can be secured through holding a charter elsewhere. Indiana, for example, requires a vote of 75 per cent of the shareholders of a company to validate a mortgage. When this presents difficulties a charter is obtained, say, in Virginia, creating "an intermediary corporation which proceeds, not to mortgage the property, but to mortgage its holdings of stock in the corporation which does hold the property."

CONTROL BY BANKING INTERESTS

Most of the alleged abuses with which Professor Ripley is concerned have, he claims, crept into the industry since the assumption of control of certain utility groups by investment banking interests whose controlling common stock represents practically no actual investment, at least in the first instance. This gives rise to what the professor terms "prestidigitation, double-shuffling, hornswoggling and skullduggery." In other words, a myriad of adjustments and exchanges of stock have been carried out, evidently with the approval of the shareholders, which have altered the whole structure.

One of the results of this banking control is the closing of the open market for new securities to competitive financing through close affiliations made between utility groups and a single banking institution. This is not characterized as an evil in itself but may give rise to abuses. A practice which appears under financial control is the policy on the part of holding companies of paying dividends on their own shares while some one or more subsidiaries may actually be in arrears or may have operated at a loss. Then there is the temptation to extend beyond what is usually regarded as the natural province of utility operations. Such examples are cited as the fruit properties of American Water Works & Electric and the oil interests of the Standard Gas & Electric and Cities Service. Here Professor Ripley reverts to the question of providing for the shareholders adequate information on the properties operated. In the case of Cities Service emphasis is placed on the large proportion of earnings arising out of oil development, and the question is raised as to whether the company is a utility or an oil-producing concern. The ethics of adding thousands of new customer shareholders on the argument of stable utility records and then engaging in the most speculative enterprise in United States business is seriously questioned. Taking the same company as an example, Ripley attacks the inadequacy of holding-company statements and the policy of providing one set of information for the use of the shareholder and another for stock exchange purposes. These statements, it is pointed out, afford no basis for allocating costs and for determining earnings as related to the investment. This makes fair rate regulation practically impossible.

SALE OF STOCK TO CUSTOMERS ABUSED

But it is not only in connection with control by banking houses that abuses creep in. According to Professor Ripley, the lack of conservative banking advice is frequently sorely felt. Apart from the unduly large percentage of obligations in the capital structure of many utilities which market their securities direct to their customers or employees, preferred stock is some-

times issued to the extent of the entire margin between feasible bond issues and the full value of the property. The vast possibilities discovered in exploiting customer ownership are often used to the limit and beyond. Some sort of regulation is urged in connection with these issues.

Another virtue which has its attendant vice is the practice of asking the holder of bonds in a local operating concern to exchange these, in the name of capital simplification, for shares of the newly created finance corporation. The position of the holder is thus shifted from that of a preferred to that of a junior claimant upon earnings. Such stock is usually termed cumulative preferred, and is, according to Professor Ripley, neither bonds nor stock, but something midway between the two. Securities of this kind are subject to the risk of vanishing returns and to the possible emission of new prior securities. It is not suggested that the issue of such securities be prohibited, but that their volume be definitely limited.

Another phase of the same situation has to do with the issue of collateral trust bonds by holding companies. Since these companies must depend on subsidiary earnings, they mortgage the income from their investment in the shares of their subsidiaries, through an issue of collateral trust bonds, secured by the deposit of such securities with a trustee. Such bonds, it is pointed out, are no true bonds, since they are not mortgages on actual property. Nor are they the only funded debt of the company as is frequently advertised. The suggestion here also is a definite limit to the volume of the issue.

Evil of Vanishing Returns

What may be considered the focal point of the whole attack is what Professor Ripley calls sensitive or vanishing returns. In the pyramiding of company upon company the equity upon which profits are earned becomes smaller and smaller the higher the pyramiding goes. The very apt comparison is to the nozzle of a hose pipe. During a period of prosperity all is well. Profits are magnified. On the down swing of the cycle, however, a very serious situation may easily arise. If the subsidiary company has no senior securities and all its stock is owned by the holding company, all is well. A gain or loss is passed on *in toto* to the parent. But when a subsidiary has already mortgaged say 50 per cent of its income for return on bonds or preferred stock, a marginal fluctuation in operating earnings is focused upon the unpledged balance—the junior securities of the subsidiary. A shrinkage of one-tenth in income would thus fall on the junior dividends, reducing them by one-fifth rather than one-tenth. A drop in operating earnings thus reduces dividends available for parent-company shareholders in geometric ratio. Where there are several companies in the set-up, the thing increases geometrically as it goes. It is subject to actual measurement, and a table is given by Professor Ripley pointing out what reduction in earnings would be necessary to wipe out parent dividends. At the top of the list of companies chosen is Columbia Gas & Electric, in connection with which a 79 per cent drop would be required. At the bottom of the list is American Water Works & Electric, in which a 12 per cent reduction, it is alleged, would wipe out parent dividends. Potentially, there is a serious danger, Professor Ripley feels, in the situation, especially since the utilities cannot adjust rates upward or downward at will as can most manufacturing concerns. Complicating the problem is the confusing financial set-up in the case of such companies as Associated Gas & Electric and Cities Service.

Stock-Watering Problem

While stock watering or the overissue of securities in proportion to the actual investment does not increase rates, as was commonly supposed some time ago, it dilutes credit and may easily impair the service rendered. For this reason, according to Professor Ripley, it is a matter of public concern. The suggestion here also is that there should be some sort of supervision to see that capitalization is not out of proportion to equity. One of the chief causes of such overissues is the keen bidding which exists for independent properties either for strategic purposes or for profit for an immediate turnover. Professor Ripley cites an instance where a company with a par capitalization of $1,600,000 recently refused an offer of $5,000,000. There are promoters in the field—not utility men at all—who are willing to pay exorbitant prices for properties which they know other interests wish to purchase. These they hold for higher prices if a quick turnover is not possible. The promotion of the Northeastern Power Company is instanced.

Then there is the general desire of management to make income statements appear as attractive as possible, and this results, Professor Ripley finds, in an irresistible impulse to pad income accounts when a further sale of securities is contemplated. Such issues are usually undertaken in periods of good business, and there is the tendency to bank on future prospects. There is a temptation to "puff up the income account by crediting profits on intercompany transactions within the system, or to reappraise assets on a rising scale of general prices." All this tends to produce a top-heaviness and instability, especially with the weaker companies. There are, as usual, certain exceptions. Companies like Columbia Gas & Electric and General Gas & Electric have reduced their obligations or lowered the value of their capital stock.

Related to these practices is a policy which Professor Ripley finds questionable—paying holding-company dividends on the basis of profits made by issuing securities for susidiaries. As an instance, Middle West Utilities reports an income for 1925 or $5,842,000, of which $3,265,000 arose out of the sale of securities to subsidiaries and others. Doubt is cast upon the justification for putting these items in profit account at all, and also upon the probability that this can continue year after year. Instead, either dividends must fall or rates must go up. The process is compared to lifting oneself by the bootstraps.

Depreciation and Renewal Provision

A question upon which Professor Ripley places considerable emphasis is provision for depreciation and renewal. The president of the Detroit Edison Company is quoted as holding the view that each item of property has a definite life and that provision for its reproduction should be made through a reserve charge against income, without resort to a new issue. Professor Ripley finds that an unfortunately large number hold the opposite view. The conclusion drawn is that advance in technique will one day necessitate the scrapping of all present plant and equipment and that truly conservative managers will have already made provision for this from current income.

All these allegations lead up to Professor Ripley's main conclusion and recommendation—that state commissions are powerless to deal with the interstate problems involved. At present where hydro-electric generation is concerned the Federal Power Commission may assume control in cases where no competent state regulation exists. The suggestion is made to enlarge the scope of this body, enabling it to supervise all interstate light and power business.

The concluding paragraphs of the article revert to the alleged real reason behind customer ownership—the ability to tap an almost unlimited reservoir of new capital without paying commissions to bankers. This leads to dangerous practices falling below the level of trusteeship. Exorbitant prices are reported to have been charged to uninformed customer buyers of stock. What if one of these huge companies should fail? The need for federal supervision or control, says Professor Ripley, is evident. No one, he admits, knows the whole answer. Two minor suggestions are the disfranchisement of the stock of operating companies deposited as collateral for superimposed issues of holding companies and standardized reports by interstate companies—in any event restraint on the ill-intentioned few. Here lies the application of the title to the article. What is needed is light and information on the actual conditions—and power to deal with them in the hands, say, of the federal government, concludes Professor Ripley.

Letters from Our Readers

Grounding of Secondaries and Transformers

To the Editor of the ELECTRICAL WORLD:

In reply to "X.Y.Z.'s" recent letter (page 806, Oct. 16) in connection with grounding the neutral of secondary circuits, I must say that it does not seem possible that any one in the electrical industry today can question this procedure. However, I do agree with him that grounding the case of a transformer on a pole adds a very undesirable hazard and should not be done.

A neutral ground properly installed and protected with wood molding adds very little to the danger of a lineman. This is especially true if proper spacing is maintained so that the lineman will be above the secondary. If this is not possible, as when cross-arm construction is used, proper pigs and blankets should be used. A lineman can protect himself if he is thoroughly trained in safety methods and is not allowed to take a chance. I must admit that "X.Y.Z.'s" statement about the number of linemen killed is true, but I believe it is caused by a let-up in safety precautions rather than by the neutral being grounded. Did "X.Y.Z." ever work on a treated pine pole? If so, he should know that there is not a great deal of resistance between him and ground.

Now, the point is, we can and must train the lineman to handle "hot stuff" safely. But what about the untold thousands of women who stand on a damp basement floor and turn on an electrical appliance? What switch or appliance is made to withstand 2,300 volts? The possibility that a tree may bring a primary line across a secondary is too great to ignore. Sooner or later a fatal accident would be the result.

I do not know whether I am more fortunate or less fortunate than "X.Y.Z.," but I have had three experiences and I don't want any more. One was from the failure of a transformer following a lightning storm when a woman attempted to turn on a light in her bathroom. Another time a tinsmith allowed a small piece of tin to fall from a roof and it fell across primary and secondary. A man's life was lost before this condition was discovered. The third accident, which happened very recently, was caused by the limb of an apple tree bringing primary and secondary together, and again a customer's life was taken. In all of the above cases the accident would have been prevented by proper grounding, as there was a fuse just ahead of each point of contact.

Now, in view of such occurrences, how in the world can any one say that grounding is anything but necessary? And one ground is not enough—"X.Y.Z." is right there. The more grounds you have the better off you are. Not only ground at each transformer, but see that every service is grounded, and don't let any small-town municipal authority tell you not to ground to water pipes. Go ahead and do it and get ahead of the water meter. It will not hurt the pipes. Anyway, who would not rather pay for a few pipes than have a life lost? J. M. F.

Alliance, Ohio.

Refinements for Oil-Switch Operating Mechanisms

To the Editor of the ELECTRICAL WORLD:

The article on "Requirements of Oil-Switch Operating Mechanisms" by Roy Wilkins, which appeared on page 753 of your issue for Oct. 9, raises a number of interesting questions.

The first is, Why is the construction of oil circuit breakers usually such that the moving contacts move in a vertical direction instead of horizontally? It would seem that the latter arrangement is more favorable in that it provides a chance for the heavier oil to displace the lighter arc gases more quickly. The arc would thus be elongated and ruptured more quickly with less energy converted to heat in the tank and the effects which accompany the operation of the breaker would be less violent. The hot gases from the arc would likewise be expelled more quickly.

The second question is, If the inertia of the oil does not permit the effect of buoyancy to come into play with sufficient rapidity to be of service, why have arrangements which deliver a strong current of oil across the arc at the moment of operation, or even continuously, not come into use?

The third question is, Why have arrangements designed to deliver an upward puff of air under the arc at the moment of operation not come into use in connection with air-break switches? The difficulties of supplying such an arrangement would seem to be of a minor nature and the advantage great.

The fourth question is, In connection with oil switches, why has so little attention been paid to the possibilities of the magnetic break as a means for stretching out and extinguishing the arc more quickly than the natural buoyancy and cooling will accomplish it? The difficulties of applying the magnetic break seem to be considerable, but it provides the possibility of applying a powerful force to the arc gases and then moving them out of the way quickly.

As the switch and circuit breaker problem is today a pressing one, it would seem that anything which promises improvement in the existing situation would be of value. It is hoped that the above questions and remarks may focus attention on some possibilities or bring better ones to light. A. F. PUCHSTEIN.

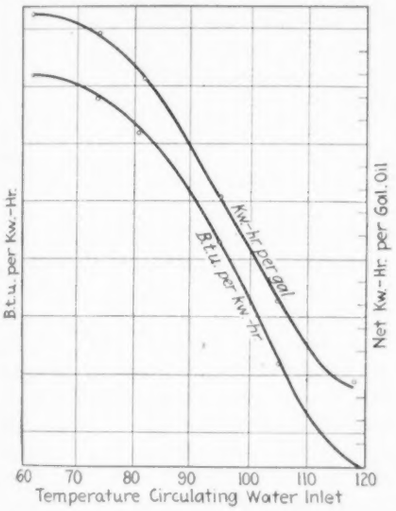
Ohio State University,
Columbus, Ohio.

Central Station and Industrial Practice

Basis for Comparison of Station Results

BY J. R. DOWDELL
Assistant Engineer Houston Lighting & Power Company, Houston, Tex.

IN ORDER to establish a basis of comparison by which to judge station operating efficiency, basic results are expected from theoretical operation of the plant under aver-



AN ARBITRARY BASIS FOR STIMULATING PLANT ECONOMY

age operating conditions. Curves like those shown in the accompanying illustration are obtained by this method, being based on the varying temperatures of the circulating water, which control the greatest variable that affects the station economy. These curves have been revised three times in the past ten years to agree with increased station economy, the data for one year showing 19 per cent higher economy than the previous year. Consequently these curves are not of permanently stable value and are obviously arbitrary in that other variables affect the station economy. However, they provide an ideal or goal toward which the operating force can direct its efforts.

Among other variables that affect station economy, which are not directly under the operator's control but which would have a serious effect on the final result, are:

1. Variation of fuel quality. Fortunately the fuel oil has very uniform quality; therefore for daily operation no allowance is made in these curves for variation in fuel quality.

2. Weather conditions, load and character of machines available, also beyond the control of the operator but controlling factors in affecting station economy.

However, the operators can control the station efficiency through the efficient operation of boilers, turbines and station auxilaries, the prevention of fuel loss by reporting all leaks in station piping and valves, the prevention of power loss through unnecessary operation of station auxiliaries, lights, etc., proper distribution of load among machines, reporting inefficient machines and apparatus, and close supervision and attention to all station equipment for operating defects.

Tap-Changing Switch for Use with Relays

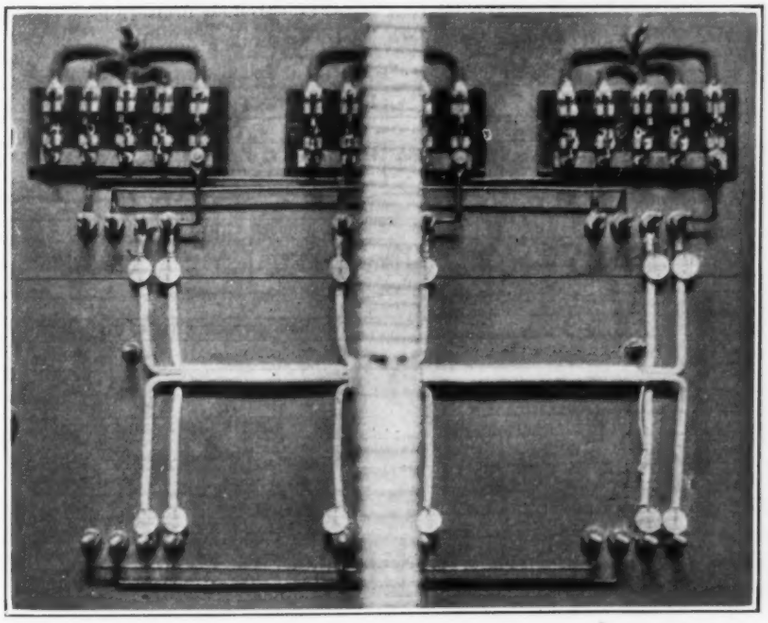
WHENEVER it becomes necessary to change relay taps frequently, the leads can be brought out of the relay and connected with some kind of a switch to accomplish the desired result. At the Mitchell Dam plant of the Alabama Power Company this was done because screws in the type IA relays were frequently stripped from changing taps at frequent intervals, resulting in loose connections. The switch shown in the accompanying illustration was designed to do this tap changing, and no further trouble has been encountered.

Standardizing Substations

BY E. D. FREEMAN
Oklahoma Gas & Electric Company

ON A large transmission system supplying small towns and requiring sectionalization it is advisable to standardize substations as much as possible. It is also advisable to keep the cost of such stations to a minimum consistent with giving good service. The Oklahoma Gas & Electric Company engineers have developed types of substations embodying these ideas for use on its large 63-kv. system.

In Fig. 1 is shown a tap substation for use on a high-tension line where no generating source occurs beyond the tap point. Oil breakers are used if generating sources are found on either side of the tap. The use of the air disconnect and fuse has been found very satisfactory and inexpensive for this type of substation, which is used to supply small communities having principally a lighting load. In Fig. 2 there is shown the layout of a substation



SWITCHES DESIGNED TO FACILITATE TAP CHANGING ON RELAYS

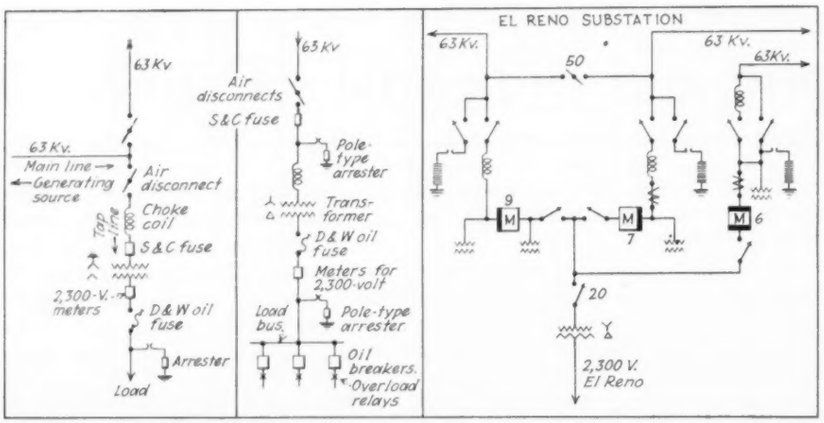


FIG. 1 (LEFT)—TAP SUBSTATION FOR A SMALL TOWN. FIG. 2 (CENTER)—TERMINAL SUBSTATION FOR A SMALL TOWN. FIG. 3 (RIGHT)—STANDARD TYPE OF TAP AND SECTIONALIZING SUBSTATION

used at the end of a high-tension line to supply a small town. Experience has shown that the low-tension oil breakers care for distribution troubles satisfactorily, and the tendency is to use automatic reclosing oil breakers on these stations. The air disconnect and fuse on the high-tension side of the transformers have proved very effective and inexpensive.

In Fig. 3 is shown a standard type of tap and sectionalizing substation developed for the system. Potential transformers are placed in the high-tension lines in order to synchronize, and one current transformer is used to operate the sectionalizing breakers. The bypass of the oil breakers is obtained by the use of an air disconnect in the event inspections or repairs are required. If wholesale power is sold at the tap, high-tension metering equipment is installed.

For each substation on the system a wiring diagram and a complete record of equipment is kept on file in the engineering department. Fig. 4 shows the form upon which record is kept of the equipment used.

Textile Hydro Plant Ties In with Utility

AN AUTOMATIC hydro-electric generating station soon to be installed by the Bibb Manufacturing Company, a textile plant at Porterdale, Ga., will be designed to operate in parallel with the Georgia Railway & Power Company system, will generate power for the Bibb plant and will improve poor power factor conditions at this point. The type of control used will be the first of its kind to be put in operation in this country.

The equipment will include two vertical waterwheel-driven generators rated 1,500 kva., 750 kw., 240 r.p.m., 2,300 volts; three 38,000/2,300-volt transformers, and a complete automatic switchboard.

The water power was formerly used to furnish mechanical power from horizontal wheels, and this old station will now be shut down. In tying in the automatic generating station with the public utility system the 2,300-volt bus will be connected to the 38,000-volt system through three single-phase transformers connected delta-delta.

With the object of supplying as much leading or corrective current to the system as possible a constant-current regulator will hold the full load of 1,500 kva. on the generators, in contrast to the usual practice of maintaining constant voltage. It is expected to improve the plant power factor by this method from 77 per cent to approximately 85 per cent.

Power for running the Bibb plant will come from the public utility lines in parallel with the automatic generating plant. The two hydro-electric generators will operate automatically in sequence and will be governed by a float switch located at the forebay. At the minimum water level one machine only will run, its entire output being made up of 1,500 kva. leading, thus having a maximum corrective effect on the system. As the water level rises, the actual energy load on the generator will increase and the supply of leading kilovolt-amperage will decrease until, at the maximum load point, the 1,500 kva. output will be made up of 750 kw. actual energy at 50 per cent power factor. The machines will run automatically under all normal conditions and will shut down automatically in case of trouble.

EQUIPMENT RECORD—SUB STATION Sheet No.

TRANSFORMERS

Line	Make	K.V.A.	Type	~	% Imp.	H. T. Volts	L. T. Volts	Pol.	Weight	Gal. Oil	Fuses	Size	El Spec	Serial	Co. No.	Position

OIL CIRCUIT BREAKERS

Line	Make	Type	Form	Poles	Volts	Amps	Weight	Gals. Oil	Operated	Opr. Circuit	Bushing No.	Serial	Sw. No.

AIR BRAKE & DISC SWITCHES

Line	No.	Make	Type	Volts	Amps	Poles	Break	Operated	Operating Oil	Serial	Sw. No.

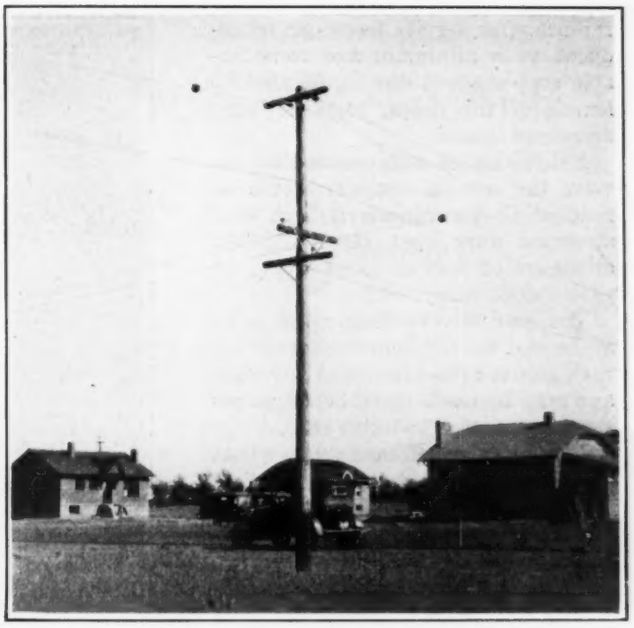
LIGHTNING ARRESTERS

Line	No.	Make	Type	Volts	Phase	Serial	

METERS, INST. TRANS. & RELAYS

Line	No.	Make	Type	Volts	Amps	Kind	Spec. No.	Serial No.	Bushings

FIG. 4—FORM ADOPTED BY THE OKLAHOMA GAS & ELECTRIC COMPANY TO RECORD EQUIPMENT USED



AT LEFT, CATENARY CONSTRUCTION FOR SECONDARY CIRCUITS THAT ELIMINATES EVERY OTHER POLE. AT RIGHT, CORNER CONSTRUCTION

Long-Span Construction for City Distribution Lines

BY H. H. KERR
Superintendent Electrical Department, Public Service Company of Colorado, Denver, Col.

IN CONNECTION with the study of long-span construction for rural districts, the Public Service Company of Colorado has recently developed a construction scheme that is suitable for city distribution. Steel-reinforced aluminum, hard-drawn copper or other suitable high unit strength conductors are used for the high-voltage circuits, whereas the low-voltage secondaries are supported at intermediate points in the span from a $\frac{3}{8}$-in. steel messenger that serves as the neutral for the three-wire service and also as the support for service drops.

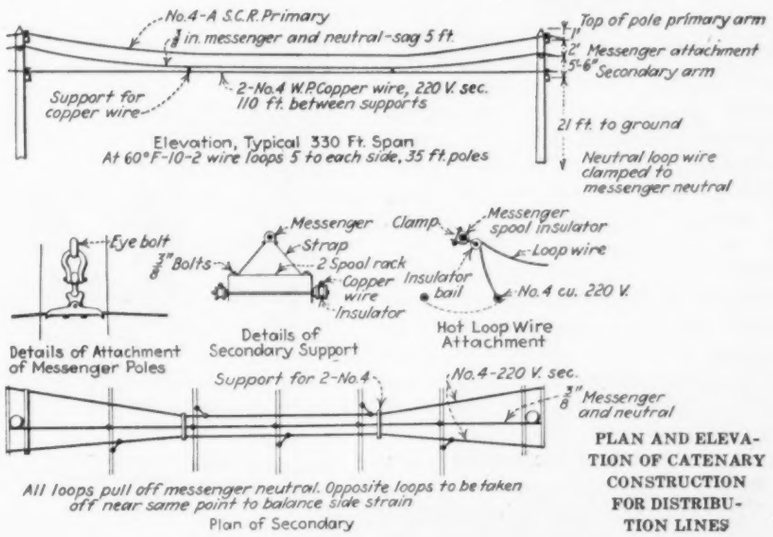
A plan and an elevation of a typical 330-ft. span, together with details of the scheme used to support the secondary wires and for the attachment of service loops, are shown herewith. The secondary wires are supported at two points in the span on a two-spool rack, which is attached to the messenger by means of a piece of strap iron bent to shape and bolted to the rack and messenger as detailed in the sketch. The secondary wires are placed on the end pins of a four-pin arm at the poles, the separation between them tending to prevent whipping of the conductors around the messenger. The plan shows the probable number of service loops that would be attached, one service loop having been allowed for each 50 ft. of property frontage. Opposite loops are attached at coincident points on the messenger to balance side strains as nearly as possible. The neutral wires of service drops are clamped directly to the messenger by means of Crosby clamps, whereas the hot wire is suspended from the messenger by means of a spool insulator and is tapped to one side of the 220-volt line underneath by means of a short jumper.

The messenger wire must be anchored to each pole to prevent uneven sags in it, since it is improbable that like numbers of loops would be attached in all spans. A suspension clamp and eyebolt hold the messenger from creeping and give flexibility, which should prevent crystallization.

Spans are 330 ft. each, only one intermediate pole having been located in blocks 660 ft. in length between street centers. This condition is the maximum that will obtain in Denver.

The smaller number of poles reduces the first cost of the installation, with a corresponding decrease in pole maintenance and capital charges. With 330-ft. spans in blocks of 600 ft. and 60-ft. streets, there can be only one pole in the way of garages, ashpits, back gates, etc.

In Denver the city requires a deposit of $5 for moving each pole in paved alleys, and 50 cents in alleys that are not paved. Considerable saving is realized if there is only one intermediate pole in each block. Since service loops may be taken off at any convenient point, tree inter-


No.4-A.S.C.R. Primary
3/8 in. messenger and neutral-sag 5 ft.
Top of pole primary arm
1'
2' Messenger attachment
5'6" Secondary arm
Support for copper wire
2-No.4 W.P.Copper wire, 220 V. sec. 110 ft. between supports
21 ft. to ground
Elevation, Typical 330 Ft. Span
At 60°F-10-2 wire loops 5 to each side, 35 ft. poles
Neutral loop wire clamped to messenger neutral
Messenger
Clamp
Messenger spool insulator
Strap
Loop wire
Eye bolt
3/8" Bolts
2 Spool rack
Copper wire
Insulator bail
No.4 cu. 220 V.
Insulator
Details of Attachment of Messenger Poles
Details of Secondary Support
Hot Loop Wire Attachment
Support for 2-No.4
No.4-220 V. sec.
3/8" Messenger and neutral
All loops pull off messenger neutral. Opposite loops to be taken off near same point to balance side strain
Plan of Secondary

PLAN AND ELEVATION OF CATENARY CONSTRUCTION FOR DISTRIBUTION LINES

ference with service loops can be reduced to a minimum and considerable copper saved due to the shorter length of the drops, together with decreased losses.

Neighborhood differences that involve the service company would be reduced to a minimum if such construction were used, since property crossings of service loops would be partly done away with.

The cost is very nearly the same as in the use of joint construction with signal companies, and any voltage may be used, there being no restrictions as in the latter case.

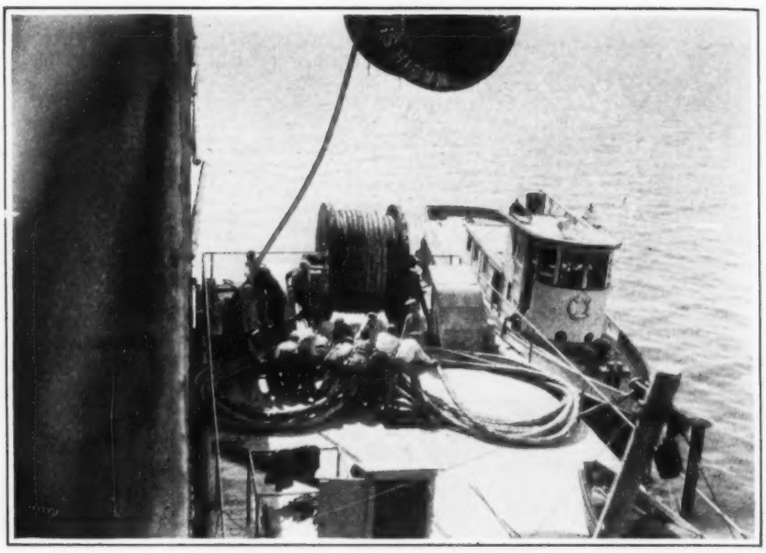
Among the disadvantages that may be enumerated is the fact that this type of construction can be applied, of course, only to pole lines that carry a few classes of service. Its use is restricted by local conditions, and in addition great care must be exercised in guying. The strain of the conductors, which are not supported by a messenger, is such that the crossarm must be guyed to a suitable stub and anchor at all dead ends. A suitable anchor capable of withstanding the maximum tension in the messenger is all that is necessary on lines where there is secondary service only. Where alleys are so located that guying facilities cannot be obtained—that is, "T" alleys, etc.—it will be necessary to install a short "slacked" span and self-supporting corner pole, the alley lead being properly anchored within the space of the "slacked" span.

Submarine Cable Laid in Record Time

BY J. M. GILLHAM
Superintendent Underground Department, Portland Electric Power Company, Portland, Ore.

WHAT is believed to be a record was established by the Portland Electric Power Company recently when an 11,000-volt, three-conductor, 400,000-circ.mil armored submarine cable was laid across the Willamette River at Portland Ore., a distance of approximately 1,800 ft., in seven minutes. The cable came from the manufacturer in two reels, one of which was placed on the barge intact and the other coiled in a figure 8. After having previously spliced the cables the figure 8 was laid out first, followed by the cable on the reel. In this manner the laying process was continuous when once started.

The cable was installed to provide better service to the business district of Portland and represents the major portion of a $300,000 budget item for underground extensions of the Portland Electric Power Company.



PLACING CABLE ON BARGE FOR CONTINUOUS LAYING
One length of cable was left on the reel and the other coiled in a figure 8 with one end spliced to end of first reel

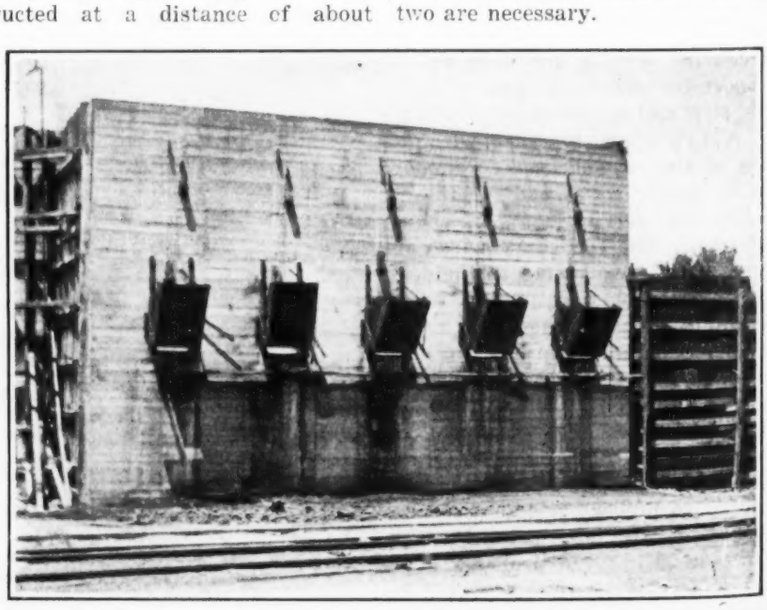
Power Plant Ashes Used by Public

BY G. A. SEAMAN
Southern Colorado Power Company, Canon City, Col.

ASHES from the plant of the Southern Colorado Power Company at Canon City, Col., until recently were dumped on company land adjacent to the plant. Necessity for a new method of disposal led to adoption of the following plan:

A concrete ash hopper approximately 12x36x25 ft. high was constructed at a distance of about 500 ft. from the plant. The ashpits at the plant and the hopper are connected with a 3½ per cent narrow-gage track, over which a Ford locomotive draws a side-dump ashcar. Five spouts on the front of the hopper permit emptying it into trucks or wagons. The city and county were offered the ashes free of charge for use on roads, etc. Free access to the ashes was also given to private individuals.

The system has been in use for several months with the result that the demand for ashes is much greater than the supply. The ease with which wagons and trucks can be loaded is a great inducement to users. Previous to this installation four men were required to handle the ashes, whereas now only two are necessary.



CONCRETE ASH HOPPER WHERE CITY, COUNTY OR GENERAL PUBLIC MAY LOAD ASHES

Commercial Activities and Public Relations

Utility Issues Booklet on Electrifying the Farm

WITH commendable forcefulness the idea that "electricity will do for agriculture what it has done for industry" has been brought out in the booklet entitled "How to Make More Money on the Farm," issued by the agricultural extension service of the Puget Sound Power & Light Company, Seattle. The booklet has an attractive front cover, which, besides carrying the title and sub-title quoted, has a picture in three colors symbolical of electrified agriculture. Within are twenty pages of terse, practical suggestions for the profitable utilization of electricity for light, heat and power in farming operations and in the farm home, together with drawings and specifications for the construction of newly developed equipment for the poultryman.

The basic idea of the book as announced on the cover is explained on the first inside page, in which it is brought out that "American industrial workers (through the application of electrically driven machinery to manufacturing) accomplish more, work shorter hours, receive more pay, save more money and enjoy more of the good things of life than the laboring people of any other country" and that "for agriculture to be as prosperous as industry in America, the farmer should benefit by industrial example and employ machinery and electric power to do the farm work wherever possible."

Following this are several pages of suggested uses in which the story is dramatized through the medium of pencil sketches contrasting old methods involving drudgery with modern methods employing electricity. Very little written matter is used in these pages, the story being put across by the cleverness of the artist in depicting, for instance, the misery of the man facing a pile of wood with a buck saw as against the apparent happiness of him who has belted a utility motor to a circular saw. Other applications are suggested under such headings as: portable farm motor; water, for irrigation and domestic use; better lighting, in the cow barn and chicken house; light, heat, power, in dairying; as well as the many uses in the home to bring comfort and leisure to the farmer's wife.

The agricultural extension service of the Puget Sound Power & Light Company is headed by J C. Scott, agricultural engineer, and is an activity of the commercial department under H. J. Gille, general sales manager. The service has given considerable impetus to the profitable extension of rural lines, principally in the western Washington territory of the company, where it is estimated that the company will build this year 600 miles of rural distribution lines to serve approximately 5,400 new farm customers.

New Salesrooms of Dayton Company

ONLY within the last year has the Dayton (Ohio) Power & Light Company been actively engaged in the sale of electrical appliances. For a number of years it was this company's practice to refer its customers' inquiries to the local electrical contractors, but experience proved that this arrangement was not entirely satisfactory and a merchandising department was created. K. Fitzpatrick, Jr., manager of the department, after about nine months' experience, states that this move resulted in creating an entirely different and improved atmosphere about the company's office. Customers who come to pay their bills are inclined to linger and inspect appliances. Sales have been so encouraging that it is hoped to put the department on a profit-making basis by next year.

PORTABLE LAMPS AN IMPORTANT PART OF DISPLAY IN NEW SALESROOM OF DAYTON POWER & LIGHT COMPANY

Training in Resuscitation

A PLAN of training in the Schaefer method of prone pressure resusciation, which will require employees periodically to demonstrate their proficiency in this work, is being worked out by the Washington Water Power Company of Spokane. Meetings of employees throughout the rural territory of the company are being held, to which the public and particularly students and teach-

ers are also invited, where the educational work is conducted by John B. Fisken, safety engineer of the company. Meetings in charge of the company physicians are now planned to demonstrate the approved first aid methods. About 60 "key" men of the company took an eight-hour course in safety practice, first aid and similar work late in April at which Martin J. Flyzik, supervisor of safety of the Washington State Department of Labor and Industries, presided.

Utility in Local Pageant

WHEN skillfully decorated, even so utilitarian a piece of equipment as an electric truck is capable of making a pleasing impression upon the critical eye seeking beauty in pageantry. The accompanying

ONE WAY OF KEEPING THE UTILITY FAVORABLY BEFORE THE PUBLIC

illustration shows a display made in a recent municipal celebration at Salem, Mass., to advertise the service of the Tenney syndicate, manager of the Salem Electric Lighting Company. Young woman employees of the Salem company in Colonial costume made no mean contribution to the good-will balance of this company as the truck made its way about town in the anniversary parade.

Power Sales Organization on Transmission System

THE Oklahoma Gas & Electric Company operates a large system that supplies 140 towns. It is in a rapidly growing territory and new towns are added frequently.

The power sales organization for the system is based on district operation and a headquarters staff at the general office. There are five districts on the system and each district has one power salesman to handle all wholesale power contracts. At headquarters there are two high-grade power salesmen and the manager of power sales.

Under normal conditions the district men care for all work, but the headquarters men are available to work on special situations or to aid a district salesman at times of peak load. The territory has a variety of loads such as cotton gins, oil-well pumping, pipe-line pumping, cotton-oil mills, lumber mills, flour mills and municipal pumping and lighting. The company operates in a territory that offers cheap oil as a talking point for the sale of oil engines. An average of two jobs a week of oil-engine competition occurs on the system and the effective work of the power sales staff is indicated by the fact that only eight oil-engine installations are found on the system, according to O. A. Jennings, manager of power sales. Gas is also abundant and cheap, and good sales efforts are necessary to sell electric service for oil-well pumping and for pipe-line pumping. More than 7,000 oil wells are pumped by electricity on this system and the oil pipe-line pumping load is of such a high load factor that it helps greatly in giving the system a 50 per cent load factor.

Under the conditions encountered it has been found best to use all-around power salesmen in the districts. They are able to handle any kind of business contract and can survey the possibilities of new towns for possible business addition.

Service of power loads of great variety on a large system is an important element in successful power sales. On this property the service department is under the jurisdiction of the system-operating department.

Electric Heat Saves Money in Hardening Process

BY E. L. KAVANAUGH
Sales Engineer Detroit Edison Company

IN A LETTER from the Hoover Steel Ball Company of Ann Arbor, Mich., to the Detroit Edison Company a very interesting comparison is made between the costs of electric and oil heating in the hardening of tapered roller-bearing cups.

In order to eliminate scaling of the product in the use of oil heat it was necessary to use a "clean-heat" process requiring special pots for containing the product. The pots were comparatively large and a loaded pot needed a considerable time lapse for the attainment of the proper hardening temperature. Because of the great number of pieces in a pot and the necessity for quenching each piece singly, those pieces that remained longest in the pot during the quenching operation received a "soaking" that changed their quality materially.

Quoting from the letter, "it was impossible to get a uniform facture from this process." Spoilage was high and lost time was about 60 per cent.

The electric furnace has eliminated both time and spoilage losses entirely and at a reduced cost. The energy consumption is about 221 kw.-hr. per ton of metal, which is approximately 9 lb. per kilowatt-hour.

Following is a table of operating costs of the two methods based on nine-hour production:

Cost of Oil Heating per Day		
Oil	$3.50	
Clean heat	20.00	
Pots	8.00	
Furnace maintenance	1.00	
Labor (eight men)	43.20	
Total		$75.70
Cost of Electric Heating per Day		
Energy	2.50	
Labor (three men)	16.20	
Total		18.70
Saving in operation per day		$57.00
Saving in operation per year (288 days)		$16,416.00

This table neglects interest, depreciation and other overhead charges that might operate to reduce the apparent saving. However, neither does it take into account the elimination of spoilage or the improvement in quality of product, which, taken singly or together, would much more than offset any reduction in saving due to the consideration of overhead costs.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Automatic and Supervisory Control of Hydro-Electric Generating Stations. FRANK V. SMITH.—The paper describes the application of automatic equipment and supervisory control to a number of interesting hydro-electric installations. A brief description is first given of the operation of standard equipment, the function performed by it and the protective measures provided. Several t pical stations involving single units, multiple units, self-synchronizing and automatic synchronizing are described, together with test results of the current surges occurring during the starting operations of several installations. Comments are ventured on the high-speed, synchronous-relay type of supervisory control and remote metering.—*Journal of A.I.E.E.*, October, 1926.

Boiler and Stoker Performance at Hell Gate Power Station.—H. W. LEITCH.—The object of this paper is to show the trend of development of stoker and boiler installations in a modern power house whose extensions have been made at fairly regular intervals and to give the effect of these yearly additions on the over-all efficiency and maintenance of the station. There is included a comparison of the essential features of the tests of the several types of installation, together with a detailed test of the latest performances. It is considered questionable by the author whether any considerable investment to improve the best-point efficiency of the station is warranted. As he expresses it, there remain, however, three important goals of endeavor. The first is to make the operating efficiency equal the test efficiency. This entails a perfect system of combustion control and a design requiring a minimum of maintenance. The second is to increase the range of high efficiency to allow of the accommodation to practical conditions of load variation and elimination of banking losses. The third is to reduce the investment by increasing the overload capacity of the evaporating surfaces and coal-burning equipment, by reducing the furnace volume and by more skillful design of the arrangement of apparatus.—*Mechanical Engineering*, October, 1926.

Generation, Control, Switching and Protection

Capacity Circuit Breaker.—F. HOFMANN.—The customary circuit breaker is a device which interrupts as suddenly as possible the flow of electrical energy. Its duty is to change the resistance at the rupturing point suddenly from zero to infinity. It is obvious that such a procedure causes grave disturbance of the condition of equilibrium, accompanied by overvoltages, arcs and occasionally explosions. Special precautions must therefore be employed to keep these undesirable phenomena within permissible limits. Very little thought has been given to the possibility of interrupting an electric circuit, not by cutting the flow, but by the more or less gradual introduction of capacity at the rupturing point. Instead of complex and costly oil switches, only disconnecting switches would have to be provided at switch points, and a few ambulant capacitors would have to be available in every station. If a given switch has to be opened, the capacitor is temporarily connected across the "disconnect," the latter is opened harmlessly, and the capacitor can be removed. Calculations indicate that such a capacitor would require about the same space as a standard breaker. Examples for 1,000-volt operating potential prove this statement. It is not so stated in the article, but it seems obvious that such an arrangement could only be used for very limited voltages.—*Siemens Zeitschrift*, August, 1926.

Transmission, Substations and Distribution

Some Notes on Electricity Transmission and Distribution Practice in Europe.—G. F. CHELLIS.—This paper describes some of the more recent overhead and underground electricity transmission systems and developments in Europe and is intended to convey a general idea of the status of that art in some of the European countries. No attempt, according to the author, has been made to include all the recent high-tension lines in the countries touched upon, but those included are typical of the work being done and the voltages in use. A most interesting part of the paper is a summary and analysis of the recent report of the Weir Commission of England recommending a policy with regard to superpower development in that country. The report covers a program extending to 1940 and proposes a plan of interconnection and base-load plant construction intended to tie together practically all parts of England.—*Journal of A.I.E.E.*, October, 1926.

Extra-High-Voltage Outdoor Substations.—Among the more recent examples of the use of extra-high-voltage outdoor substations in England are those on the North Metropolitan Electric Power Supply Company's main network. Five such substations are to be fed from the company's Brimsdown generating station, being connected partly by 33-kv. underground cables and partly by 33-kv. overhead transmission line. In a station of this description wherein the busbars are always "alive" it is important that painting and cleaning of the supporting structure be reduced to an absolute minimum; consequently the structure has been built of reinforced concrete, which is impervious to the atmosphere, in preference to galvanized steel. Although more expensive initially, this will prove economical in the long run, it is believed. Special attention has been paid to the lighting equipment on the outdoor gear to enable switching operations to be carried out at night.—*Electrical Review* (*England*), Oct. 1, 1926.

Units, Measurements and Instruments

Photo-Electric Photometer. — The principle of this instrument is that two beams of light from an electric filament lamp traverse two different, but similar, paths. By means of a shutter either ray is cut off so that at any moment only one ray can enter the photo-electric cell, in which it liberates a photo-electric current. This current is observed in the electrometer, forming part of the instrument. The one ray passes through the plate under test, the other ray passes through an optical wedge, and the wedge is raised or lowered until the deflection of the electrometer remains unchanged when the position of the shutter is changed over. The reading of the wedge then gives a measure of the density of the deposit on the plate. The advantages of the instrument, according to the author, are the slow changes in the sensitivity of the cell. The observer relies upon the repetition of an extreme deflection of his galvanometer. Gradual changes in the battery strength or in the sensitiveness of the cell do not affect that determination.—*Engineering* (*England*), Sept. 24, 1926.

New Permeameter.—R. V. PICOU.—To overcome certain disadvantages and inconveniences of the hitherto known permeameter, a French concern developed and brought on the market a new model which is described in this article. The test bundle of laminations, consisting of about 30 sheets, 8 in. by ½ in., is placed within a coil, the magnetic path being closed by a packet of other laminations, passing a second coil. Three small exploring coils, installed within the main bobbin around the tested sheets, are connected to a ballistic galvanometer. A current-reversing switch and the necessary rheostats are built into the pedestal of the apparatus. Measuring results indicate an average accuracy of about 1 per cent.—*Revue Générale de l'Electricité*, Sept. 4, 1926.

Illumination

Proposed Basis of Rating for Measuring the Quality of Street-Lighting Service.—A. J. SWEET.—The problem of measuring the quality of street-lighting service is an extremely complex one, made up of various elements which must be independently measured and the results of such measurements combined with due regard to the relation of each element to the complete quality value. The principles governing the derivation of a net value from the values of elements and qualities is first studied. A division of the subject is then made as between utilitarian and esthetic qualities of street lighting. Illumination intensity measurement and brightness measurement, each taken as a significant point of measurement and each reduced to such value as would be equivalent for discernment were glare entirely absent, are then combined, the basis of combination varying with the value of the illumina-

tion intensity measurement. Service quality is separately measured for roadway and sidewalk, and the independent values are combined into a single value. With respect to esthetic qualities, the conclusion is reached that it is practical to derive certain principles of a general nature which will be of value in arriving at decisions as to relative esthetic merit, but that any quantitative evaluation of esthetic merit is impossible at this time. The relative weight which should be given to utilitarian considerations and to esthetic considerations in the design of a street lighting system is analyzed. — *Paper presented before Illuminating Engineering Society*, Sept. 10, 1926.

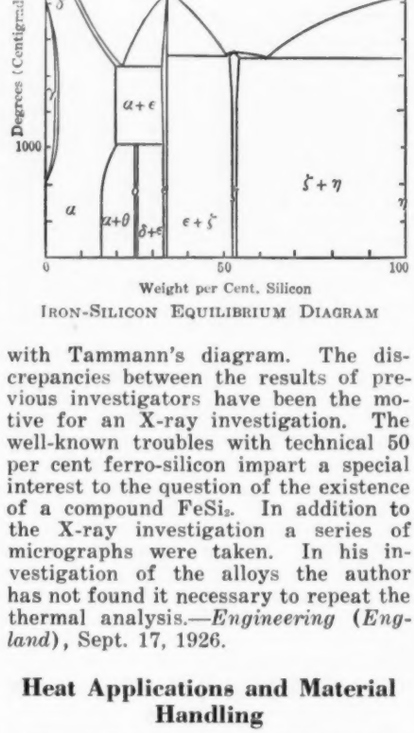
Motors and Control

Synchronous Motor Clocks. — H. VOIGT.—The basic idea of driving a clockwork by a small synchronous motor connected to an alternating-current supply, and thus to derive "time from a lamp socket," is about 20 years old, but it did not gain popularity until the tying of several generating stations into one system necessitated a close maintenance of constant frequency. A considerable amount of propaganda is now being spread in favor of these clocks, carefully omitting the fact of the many unavoidable temporary interruptions of current supply due to blown fuses. Each interruption stops, of course, the clocks connected to the circuit, and the synchronous motor is usually not self-starting. Stopped clocks or, with self-starting motors, wrong time indications are a serious drawback of these timepieces. In the author's opinion, a combination of such a clock and an automatically started mechanical clock in case of interruption should be developed. On the other hand, plain mechanical clockworks, set frequently by radio time signals, may give excellent service. But the general use of the present type of synchronous motor clock may miscredit electric timing service.—*Elektrotechnische Zeitschrift*, Aug. 26, 1926.

Individual Drive of Machines.—W. STIEHL.—In spite of the undeniable and generally conceded advantages of individual electric drive of machinery, the author regrets the very slow progress which is being made along this line in German factories, other countries being far ahead in that respect. To illustrate the possible improvements, the author selects in particular textile machinery and compares transmission drive with modern electric operation. Measurements made in large mills showed an over-all efficiency as low as 10 per cent for transmission drive. In a great many instances it was found that the factory owner thought to provide individual drive by installing a motor near the tool machine, formerly transmission-driven, connecting the motor with the machine by a belt. But this, the author states, is only a half-way solution. The modern trend lies in close co-operation between the mechanical and the electrical designer, resulting in tool machines with motors directly built in to form an organic unit. Many examples of such types are shown. This idea has been carried so far that spinning machines are being built today with a small motor for each individual spindle. A minimum of floor space, highest operating economy and utmost safety are salient features of factories equipped with such machines. In addition, a great improvement in lighting, both daylight and artificial, results from installations of this type. The seven-page article contains 35 illustrations.—*Zeitschrift des Vereines Deutscher Ingenieure*, Sept. 18, 1926.

Electrophysics, Electrochemistry and Batteries

Constitution of the Iron-Silicon Alloys.—G. PHRAGMEN.—One of the first constitutional diagrams that Tammann constructed, by the method of thermo-analysis, was that of the iron-silicon alloy. According to this diagram, only one intermediary phase is present. Tammann has pointed out that only this compound exists, and that the many "compounds" found by chemical analysis of residues did not enter into the consideration. There are, however, some observations published which, according to the author, are irreconcilable



IRON-SILICON EQUILIBRIUM DIAGRAM

with Tammann's diagram. The discrepancies between the results of previous investigators have been the motive for an X-ray investigation. The well-known troubles with technical 50 per cent ferro-silicon impart a special interest to the question of the existence of a compound $FeSi_2$. In addition to the X-ray investigation a series of micrographs were taken. In his investigation of the alloys the author has not found it necessary to repeat the thermal analysis.—*Engineering (England)*, Sept. 17, 1926.

Heat Applications and Material Handling

Thermal Insulation of Electric Furnaces. — M. L. HARTMAN and O. B. WESTMONT.—In this paper the thermal insulation of various types of electric furnaces is discussed. The thermal conductivities of fused alumina, fused magnesia, fireclay and a high-temperature insulating refractory are given in addition to the published data on silicon carbide, otherwise known as carborundum and silica. Mean specific heat curves for these refractories are also given. The temperature, heat losses and heat capacities of thirteen types of electric furnace linings are tabulated, with the inside surface temperatures assumed to be 1,600 deg., 1,400 deg. and 1,200 deg. C. The object of this paper, according to the authors, is to suggest possibilties of energy conservation in electric furnaces by properly designed composite walls.—*Paper presented before American Electrochemical Society*, Oct. 11, 1926.

Traction

Power Supply for Swiss Railway Electrification. — H. EGGENBERGER. — After eight years of electrical and cost investigation, the Swiss railway electrification committee decided in 1912 to change all federal railroads from steam traction to electric drive. Switzerland has at present 1,800 miles of federal roads, of which 1,000 miles will be electrified by the end of 1928, requiring annually 350,000,000 kw.-hr. at the power stations. The single-phase, 16⅔-cycle system with 15-kv. overhead-wire voltage was standardized for all roads. The very large and constantly growing supply of power for these railways is derived from eleven hydro-electric stations distributed over the country. The article gives short descriptions and recites the most important features of these power stations. Plans or photographs are shown of every station.—*Schweizerische Wasservirtschaft*, Aug. 25, 1926.

DATA ON SWISS FEDERAL RAILWAY POWER STATIONS

Name	Hydraulic Head Ft.	Output in Hp. Existing	Output in Hp. Ultimate
Amsteg	900	12,000	90,000
Ritom	2,600	8,000	60,000
Goschenen	260	1,400	1,800
Barberine	2,400	11,000	65,600
Vernayaz*	2,000	5,400	115,800
Eetzel	1,550	22,500	120,000
Ruppeswil	40	9,000	60,000
Waggital	1,400	140,000	210,000
Chancy	30	47,000	.....
Peuffeyre	1,300	18,000	.....
Ryburg*	36	118,000	.....

*Not completed.

Telegraphy, Telephony, Radio and Signals

Neutralization of Telegraph Crossfire.—R. B. SHANCK.—With the simple means described in this paper for neutralizing mutual interference between parallel telegraph circuits, it has been found practicable to effect a reduction to 10 or 20 per cent of the original values. This has improved considerably the operation of some circuits and made available others which were previously unsuitable. The resulting improvement in transmission has made possible the elimination of certain intermediate telegraph repeaters, with material savings. The neutralizing apparatus has no material effect when crossfire is not present; that is, when the paralleling wires are idle. It has been found that the use of arrangements here described on certain long open-wire circuits makes possible fast manual full-duplex operation where only medium-speed half-duplex operation was possible before. Furthermore, in the case of some cable circuits where it was impossible to operate more than two telegraph circuits per quad it is now practicable to obtain four telegraph circuits.—*Reprint B-205, Bell Telephone Laboratories.*

News of the Industry

Apparatus Division of N.E.M.A. Meets

New Organization of Former Power Club Perfected and Work Outlined at Briarcliff Manor—Industry Statistics and Business Policies Discussed

MORE than two hundred delegates journeyed to Briarcliff Manor, N. Y., this week to attend the first convention of the Apparatus Division of the National Electrical Manufacturers' Association, into which the Electric Power Club has been merged. This meeting was held from Oct. 25 to Oct. 28, and topics of much importance to electrical manufacturers came before it.

On Tuesday evening Gerard Swope, first president of the N.E.M.A., gave an address in which he outlined the new electrical organization. All branches of the electrical manufacturing industry are represented in it, and the organization will operate with a board and with three initial divisions, which will probably soon be increased to four. The Apparatus Division, the Supply Division and the Executive or Policy Division, already organized in part, will consist of unit groups of manufacturers with several sections in each division. The proposed fourth subsidiary body will be the Radio Division.

In the opinion of Mr. Swope, the new organization will bring unity and coordination among electrical manufacturers representing an annual gross business of $1,500,000,000 and will permit the manufacturing industry to act as a unit on matters of mutual interest or on national affairs affecting the electrical industry. President Swope read a letter from Secretary of Commerce Hoover in which Mr. Hoover said:

"I was glad to see the formation of the National Electrical Manufacturers' Association, as it appears that we shall now have an association covering the whole of the many different branches of manufacture of electrical apparatus. I believe such an association under proper guidance can perform a very useful service not only to the industry but to the public.

"Obviously this is an electrical age, and it is the duty as well as the privilege of manufacturers to foster and forward the wider use of electrical apparatus, for it brings greater comfort and convenience into the home and relieves sweat in the workshop. Of more importance, perhaps, than this is the fact that a truly national organization can undertake definite programs for the elimination of waste such as a collection of smaller associations could not effect. We have need of a great deal of standardizing of supplies and apparatus; we have need of simplification in many directions; we have need of more economic study and industrial statistics in the industry—all of which contributes to the more enlightened conduct of business and ultimately results in greater stability to industry and in favorable returns to the consumer and the public. A constructive trade association dealing with these fundamental questions is a necessity of our modern industry."

The rules of procedure, the complete formation of divisional organizations and other details of the new organization are now being prepared, and rapid progress was announced by Mr. Swope.

GERARD SWOPE, FIRST PRESIDENT N.E.M.A.

J. M. Curtin, vice-president of the N.E.M.A., who becomes chairman of the Apparatus Division, followed the address of Mr. Swope with an outline of the work of that division and made many constructive suggestions for the coming year. He urged all members to report freely the facts needed by the several sections so that the industry could operate more intelligently. The production of standards for manufacture and operation of apparatus has been well done by the division, he said, but there remain many opportunities in the development of principles of business conduct and in the compilation of industry statistics whereby business conditions could be improved. Mr. Curtin also suggested that a national electrical industry exhibition might be a worth-while development to follow the formation of the National Electrical Manufacturers' Association.

During the week the various sections of the division met together and discussed developments and practices. All these meetings were well attended and much constructive work was done. In the evening general meetings were held at which topics of general interest were discussed. At the meeting on Tuesday a committee reported on the progress of industry statistics and the formulation of data on business practices. Remarkable progress was recorded and the members voted that the committee continue its work. The presentation of the James H. McGraw award to Clarence L. Collens is recorded on page 942.

Golf, tennis and the banquet on Thursday night added elements of sport and pleasure for the entertainment of the members and the ladies who accompanied them. The unanimous opinion was that the first meeting under the new organization was entirely successful.

Central Maine Power May Build 100,000-Hp. Plant

In his annual report to the stockholders of the Central Maine Power Company President Walter S. Wyman predicts the immediate erection of a 100,000-hp. hydro-electric plant at Bingham on the Kennebec River should the Legislature repeal the law prohibiting the export of electrical energy from the state. "A change in the power export law," he says, "which would allow surplus power to be sent out of Maine into New Hampshire and Massachusetts would undoubtedly make it possible for us to proceed immediately with the construction of a 100,000-hp. plant at Bingham, and I hope to see this change come about and see this plant built within the next few years."

Mr. Wyman also refers to the three-unit, 27,000-hp. plant now under construction at Gulf Island above Lewiston, the first unit of which has just gone into operation, sixty days ahead of the time scheduled. The other two units, Mr. Wyman says in his report, will probably be completed and put in operation during the winter.

California Maintains Stand on Six-State Colorado Pact

When the special session of the California Legislature called by Governor Richardson to ratify unconditionally the six-state Colorado River compact met last week, both houses overwhelmingly declined to comply with the Governor's request. Instead a joint resolution was passed reaffirming the reservations passed by the 1925 Legislature. This resolution declared: "It is unnecessary and inadvisable to take action respecting the Colorado River compact as contemplated in the call for the special session," and that "the plan of handling interstate rights and relations respecting the waters of the Colorado River as expressed in the

Swing-Johnson bill is hereby approved and assurance is hereby given that upon the passage of said bill the state will take such action as may be necessary to render the bill operative and the compact unconditionally effective."

Governor Richardson in his message to the special legislative session pleaded for unconditional ratification of the six-state pact to clear the way for consideration of the Swing-Johnson bill at the short session of Congress in December.

Hydro Plant on the Batiscan River, Quebec, Starts Up

Another unit in the Shawinigan Water & Power Company's system in the Province of Quebec was brought into operation on Oct. 22, with the official opening of the St. Narcisse power development on the Batiscan River. Formal ceremonies and a luncheon marked the occasion.

The new development has an installed capacity of 22,000 hp., and the power generated is transmitted at 60,000 volts to Three Rivers, where it feeds into the Shawinigan system. The North Shore Power Company, a subsidiary of the Shawinigan Water & Power Company, developed power on this site as early as 1893 and transmitted it at 15,000 volts to Three Rivers, a distance of 17 miles. The North Shore company utilized the "Grande Chute" of the Batiscan for its old development, but three years ago it acquired also the rights to three other smaller falls a short distance down the stream. The present development utilizes all three falls and contains features which are unusual in power construction. It consists of a comparatively low dam above the Grande Chute, the power house in the gorge near the foot of the rapids and a tunnel 13 ft. in diameter through which the water is carried from the dam to the power house. The tunnel had to be driven through solid rock and from four different points.

St. Lawrence Permit Again Postponed

Absence of Quorum at Meeting of Water Power Commission Puts Action Over Till After Election—Financial Plans of Rival Applicants Sketched

ABSENCE of a quorum, whether or not brought about by political considerations, put over until a future date, at some time after election, definite action by the New York State Water Power Commission on the permits pending before it for development of St. Lawrence River water power. At the hearing on Monday, Oct. 25, the evidence was closed. After the various members of the commission have approved the minutes a date will be set at which final briefs will be received from the American Super-Power Corporation and the St. Lawrence Valley Power Corporation. At the hearing James W. Rickey, hydraulic engineer for the Aluminum Company of America, and Colonel Hugh L. Cooper offered further evidence in relation to the feasibility of the development from an engineering standpoint. Colonel Cooper stressed the importance of the ice problem which will have to be met in construction.

A financial picture of how the development would be financed was presented by both of the applicants. Both plans are, of course, tentative and dependent upon future conditions in the money market. George T. Bishop, president of the Frontier Corporation, which would finance the project if the permit is issued to the St. Lawrence Valley Power Corporation, said the initial expense would be borne by the stockholders of his corporation, possibly up to the point where definite progress in the development had been made, and that the ultimate financial plan would call for 50 to 60 per cent of the cost to be raised by mortgage bonds and 40 to 50 per cent divided equally between common and preferred stock.

Arthur B. Leach and Fay C. Hamilton, representing the Doherty interests and American Super-Power Corporation, said that in their judgment 75 per cent of the cost should be raised by mortgage bonds, 20 per cent by preferred and the balance by common stock. They would individually advance the moneys necessary for the engineering costs and market bonds when contracts were let for actual construction. Mr. Hamilton expressed confidence that if the utility market continues as it has for the past five years money can be obtained at from 4 to 4½ per cent. Mr. Hamilton declared it was the purpose and intention of the American Super-Power Corporation to sell the securities in the enterprise to the people of the State of New York.

The absent members of the commission were Attorney-General Ottinger and Speaker McGinnies. The next meeting of the commission will, it is thought, be held early in November.

Attacks New York's River-Regulating District Act

An attack on the river-regulating district act of New York State has been made by E. W. Cady, Jr., secretary of the Adirondack Civic League, who bases his strictures on testimony given when the application of the Malone Light & Power Company for the creation of a reservoir on the Salmon River, in the Adirondacks, came before the State Water Control Board. This hearing was indefinitely postponed.

Mr. Cady claims that, under what he terms a "joker" in the law, the state would in this instance contribute 1,290 acres of land in the forest preserve, valued as land not to exceed $10 per acre, a total of $12,900, on which it would receive annually 6 per cent, or $774, or about 6½ cents per horsepower per year. The annual rental proposed for the St. Lawrence power under the Ottinger-Finch plan is $2.25 per horsepower per year, or about 35 times as much. Mr. Cady continues:

"One grasps the magnitude of the issue involved when it is realized that the state would receive $1,300,000 per annum if $2.25 per horsepower annual rental was paid for the 580,000 hp. increased primary power produced by the storage reservoirs on the Adirondack rivers, as against a little less than $18,500 a year if taken under the 'joker' in the act, a discrimination in favor of the private owners of the water rights of $1,281,500 per year.

"This rental" says Mr. Cady, "is probably not sufficient. On the basis of $5 per year per horsepower of primary power increase the return to the state for its assets used in the reservoirs on the Adirondack rivers would be $2,900,000 per year, much more than the annual return to the state for the St. Lawrence under the Ottinger-Finch plan."

Vote on New Commission Law in Colorado

On next Tuesday, Nov. 2, there will be a referendum vote in Colorado on a proposed law which will vest a newly created commission with complete jurisdiction over all public utilities except those municipally owned. Colorado is now one of the few states where the regulation of public utilities is not state-wide. In Colorado jurisdiction has been divided between a few "home rule" cities, with municipal regulation, and the Public Utilities Commission of the state, with jurisdiction in all other communities.

Boston Edison and Tenney Agree Upon Power Contract

Following an extended investigation of the economic possibilities of increasing the amount of energy purchased from the Edison Electric Illuminating Company of Boston, the Eastern Massachusetts Electric Company and the former recently appeared before the Massachusetts Department of Public Utilities seeking approval of a ten-year contract for this purpose. The Eastern company interconnects the principal central stations in the North Boston Lighting Properties group managed by Charles H. Tenney & Company of Boston, and these include the Malden Electric Company, Suburban Gas & Electric Company, Salem Electric Lighting Company and Beverly Gas & Electric Company. Most of the energy used in these systems is generated at the Salem steam plant, although an important interconnection has been in use for several years between the Tenney and Boston Edison company lines, and in 1925 the Edison company sold 5,297,000 kw-hr. to the Tenney group.

It is now proposed greatly to increase this taking, and the contract provides that the Edison company's obligation to install additional lines shall cease when the demand of the Eastern company reaches 100,000 kva. Under its terms the Eastern company guarantees the Edison company at least twice the cost of the lines required to render the

service, and an initial investment of $250,000 is contemplated, according to F. M. Ives of the Edison company. The Edison company's "N" rate, under which the Cambridge and Quincy companies are supplied, will apply to the contract. It is expected that this agreement will indefinitely postpone the building by the Tenney interests of another steam generating plant at Salem to supply the growing load of the north Boston system.

Cleveland Electrical Industry Well Demonstrated

Two thousand of the leading business men of Cleveland participated in the combined meeting and exhibition held, according to last week's announcement in these columns, on Tuesday, Oct. 26, for the purpose of demonstrating the electrical industries established in that city and designed as the first in a series of four such industrial celebrations sponsored by the Cleveland Chamber of Commerce in co-operation with the Electrical League and 29 other local civic and business organizations.

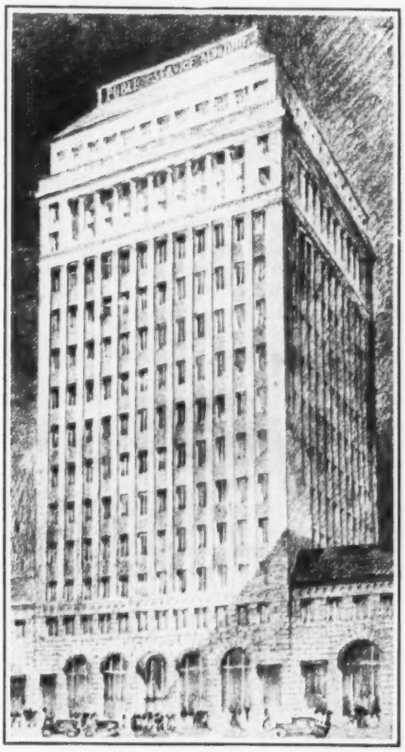
As a preliminary, the Electrical League of Cleveland set a special force of men to work making a census of the electrical industries, the first time anything of the kind had been attempted in that city. The census developed the fact that Cleveland has 135 manufacturers of electrical products, utilizing $75,000,000 of capital, outside of the hundreds of millions invested in the electrical public utilities, employing 16,000 people and turning out 250 different products ranging from minute 2-watt lamps to giant electric cranes and from tiny motors to electric street cars. The output of these manufacturers in the last year had a value of $130,000,000, exclusive of the value of public utility services.

Addresses of no little interest were made by J. F. Lincoln, vice-president and general manager of the Lincoln Electric Company, who is also vice-president of the Cleveland Chamber of Commerce, and M. H. Aylesworth, until very recently managing director of the National Electric Light Association.

Cheap electric power supplied by the electric utilities is the chief antidote for the industrial, commercial and domestic burdens of this country, Mr. Aylesworth, who is now president of the National Broadcasting Company, declared in his address at the luncheon meeting. "Electric power," Mr. Aylesworth continued, "is the most important offset against high cost of labor, high transportation charges, high prices of materials and high tax rates. It is one of the major assets of the American people." He went on to compare the per capita use of electrical energy in the United States with that in other countries.

President W. B. Stewart of the Chamber of Commerce opened the meeting, and Charles F. Brush, inventor of the Brush arc lamp, was among the prominent men presented to the audience. Most of the electrical products made in the city were on display on raised platforms, and following the meeting the exhibits were opened to the public.

New Public Service Building for Portland, Ore.



CONSTRUCTION of the "Public Service Building" in Portland, Ore., which is to house the offices and salesrooms of the Pacific Power & Light Company, the Northwestern Electric Company and the Portland Gas & Coke Company, is to start at once with the letting of the contract for more than $1,500,000. The building, which will be fifteen and one-half stories in height, will occupy the half block on the east side of Sixth Street between Taylor and Salmon Streets.

The three companies will occupy all but six floors of the building, including the ground floor and two basements. One basement will house a new substation for the Northwestern Electric Company. The ground floor will be divided between the Northwestern Electric Company and the Portland Gas & Coke Company principally for appliance display rooms and for customers. The third floor is to be given over to facilities for the employees of all three companies and will contain recreation and rest rooms, an assembly room, a library, a restaurant and an emergency hospital. Six floors will be available for rent.

The building, which will be the tallest in Portland, will be of concrete and steel construction with a green tile roof and will be faced with terra cotta and brick. It is to be of Italian Renaissance style, with marble floors and wainscoting. The lobby will be of marble with an ornamental ceiling. The first two floors, of which only part is shown in the reproduction of the architect's drawing printed here, will extend over the entire half block, and the remaining thirteen and one-half floors will occupy the central 100 ft. of the property, thus creating a tower-like effect. Should the future demand it, the side wings can be extended upward to the twelfth floor. The building was designed by A. E. Doyle.

Supply Jobbers to Broaden Membership

Movement by "Independents" Bears Fruit—Educational Course for Jobbers' Salesmen Now Ready—Addresses and Presentation of Certificates

AT THE winter convention of the Electrical Supply Jobbers' Association, held last week at the Hotel Traymore, Atlantic City, interest revolved largely around a movement on the part of the independent members of the association to bring about a larger representation from among the "free-lance" distributors of electrical supplies, so called to distinguish them from houses comprising the three groups affiliated with the General Electric Company, the Westinghouse Electric & Manufacturing Company and the Graybar Electric Company. Under the leadership of McKew Parr, president Parr Electric Company, New York, these "independent" members of the association held an informal meeting in advance of the convention session and appointed a committee to confer with the executive committee of the E.S.J.A. As a result of a general discussion of the desirability of a larger number of independent supply houses in the association and to encourage an expansion in this direction, the requirements for membership were reduced 50 per cent. Hereafter membership will be open to houses having a capital investment of $50,000 and annual sales of $250,000 and fulfilling the recognized functions of a jobber.

The completed textbook on "Constructive Salesmanship," which has been in process of development for the past year, was presented to the convention by the committee on dealer co-operation. This takes the form of a study course for jobbers' salesmen embracing the fundamentals of business practice for the contractor-dealer, including the figuring of cost and overhead, correct estimating, economic buying, store locations and management, choice and display of merchandise, turnover, sales and collections. These lessons will be provided by the association to its membership and conducted as a study course under the direction of the sales manager of each house, to school the jobbers' salesmen to understand better the business of the contractor-dealer and to be able to give him more intelligent guidance. O. F. Rost is responsible for the production of the course. W. R. Herstein is chairman of the committee.

Loyal A. Osborne, vice-president Westinghouse Electric & Manufacturing Company, addressed the convention on the subject of "The Real Value of

Trade Associations" and discussed the interrelations of the different branches of the industry as they function in the flow of goods and the need for a coordinated program in guiding distribution. B. W. Ruark, executive secretary of the Radio Manufacturers' Association, spoke on "Important Factors in Radio Merchandising" and outlined present trends in the wholesaling and retailing of radio. Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, presented certificates of honorable mention given under the James H. McGraw award to W. S. Berry, W. I. Bickford, T. J. Creaghead and H. F. Thomas, as reported last week on page 884. Announcement was made that the next meeting of the association will be held in Montreal in May.

Jacksonville Municipal-Plant Bond Issue Carries

The election held at Jacksonville, Fla., on Tuesday, Oct. 26, to approve or disapprove the issue of $2,000,000 bonds for an extension of the municipal electric plant proved to be a victory for the bond advocates, the returns showing two votes for the issue to every vote against it. Frank Owen, chairman of the City Commission, declared that the municipal plant could now continue to keep pace with the growth of the city. "The present installed generating capacity of the plant is 27,500 kw.," he said. "Basing the growth for the next few years on that of 1925, the plant will be called on for a peak load of 36,000 kw. in 1930. With the new 25,000-kw. generator and three 1,500-hp. boilers that we shall be able to purchase with this bond money, the plant should carry us to 1934 without further additions."

Rapid Electrical Progress on Farms of Idaho

Use of electric power on the farms of Idaho is proportionately larger than in any other state except the three Pacific Coast states and two New England states, says the progress report of the Idaho Committee on the Relation of Electricity to Agriculture. This report, prepared in manuscript form originally, has recently been submitted to Governor C. C. Moore in its final condition. The report shows further a close correspondence between irrigation and the use of electricity on the farms. In other words, says the report, use of electricity is greatest on irrigated farms, not so great in the semi-dry areas, by which are meant the north Idaho wheat regions, and is sparse in the dry farm areas.

The total number of rural consumers receiving power in Idaho is reported by the 36 power companies of the state to be 7,006, served by 1,259 miles of rural distribution lines. "The irrigation pumping load," declares the report, "is a special factor in the rural use of electricity in Idaho. A large part of the total power utilized in the state is supplied to irrigation pumping. . . . The high-tension lines [to supply these units] running across the farms make it possible to install small substations to supply rural distribution lines."

Purchases and Mergers

Utilities Power & Light to Buy Insull Indianapolis Interests—Foshay Buys Montpelier & Barre

UNION of the competing light and power companies in Indianapolis—the Merchants' Heat & Light and the Indianapolis Light & Heat—referred to last week under a separate heading (page 869)—will, if the plans go through, be brought about through the acquisition by the Utilities Power & Light Corporation, Chicago, of the Merchants' company from the Insull interests and also of the minority stock holdings of the latter interests in the Indianapolis Light & Heat. The Utilities Power & Light owns operating companies in the Middle West and also in New Jersey. Early in this year the Insull interests acquired 28½ per cent of the common stock of the Indianapolis Light & Heat, paying, it is said, more than $6,000,000 for the stock, which was at a rate of $500 a share for stock with a par value of $100. Later the remaining common stock was acquired by the holding company, which is headed by Harley L. Clark of Chicago. It was erroneously stated in the ELECTRICAL WORLD last week that an attorney for the Merchants' Heat & Light Company had appeared before the Public Service Commission in the matter. The attorney who appeared represented the Indianapolis Light & Heat Company.

On Jan. 15, 1927, the W. B. Foshay Company will take over the Montpelier & Barre Light & Power Company and its subsidiary, the Green Mountain Power Company of Vermont, properties which serve a population of 50,000 with electric light and power. The properties of the Montpelier & Barre Light & Power Company will be taken into the People's Hydro-Electric Vermont Corporation, a subsidiary of the People's Light & Power Corporation, which will own all the common stock of the Green Mountain Power Company. The People's Hydro-Electric Vermont Corporation operates extensively in Vermont, owning the Burlington Traction Company in Burlington and electric properties in Vergennes and surrounding territory. In taking over the Green Mountain Power Company, which is just completing a new hydro-electric development at Molly's Falls (see ELECTRICAL WORLD for Oct. 23, page 876), the corporation will save, it is estimated, $75,000 per year in steam-plant operating expenses.

Approval has been given by the Wisconsin Railroad Commission to the negotiations by which the Wisconsin Gas & Electric Company is to take over the electric and gas municipal plants at Fort Atkinson for $450,000. The way is now clear to place the matter before the voters.

The Public Service Commission has granted the application of the Mohawk-Hudson Power Corporation (recorded in the ELECTRICAL WORLD for Oct. 2, page 719) to acquire and hold all or more than 10 per cent of the outstanding common capital stock of the Troy Gas Company, which has an electric division. The Mohawk-Hudson company now controls most of the electric and gas companies operating in territory adjacent to Troy. The Troy company now purchases its electricity from the Adirondack Power & Light Corporation, owned by the Mohawk-Hudson company.

The Nevada-California Electric Corporation has purchased the Yuma Utilities Company, serving Arizona territory south of Yuma. The price was not given. The Yuma has been purchasing its power from the Nevada-California, distributing it over its own transmission lines.

Haddam, Kan., to which the Kansas Power Company, Concordia, has wholesaled energy since 1921, has sold to that company its distribution system and transmission line.

New England Power Purchases Storage Facilities

Stockholders of the New England Power Association have ratified an agreement for the purchase of the Connecticut Valley Lumber Company and the resale of its timber lands to a new corporation to be controlled jointly by the International and St. Regis Paper companies. The Power Association will retain control of water rights on the upper Connecticut River, permitting the developmeint of 80,000 kw. By this deal the Power organization will acquire control over lumber ponds which can be utilized as storage reservoirs to eliminate floods in the river as far south as Turners Falls, Mass., also increasing the annual kilowatt-hour output of the developments at Vernon and Bellows Falls. The lumber company owns 320,000 acres of timber land in northern New Hampshire and Vermont in addition to its undeveloped water powers. The Power Association will pay $1,000,000 in cash, of which $300,000 will be retained for condemnation of lands necessary to power development not now owned by the lumber company, and 95,238 shares of Power Association common stock. The latter will be delivered in five annual installments, including 1931, or earlier if the so-called Fifteen-Mile Falls development is completed before the latter date.

Speed Record in Rehabilitation by Westinghouse

In the midst of reconstruction on the Florida Causeway after the hurricane, the motors operating the bascule bridge at Miami, over which the boulevard passes, gave out and supplies necessary to Miami and other towns were held up by the accident. New coils were necessary. Miami sent an urgent call to the Atlanta offices of the Westinghouse Electric & Manufacturing Company, forwarding sample coils by air mail. Upon receipt of the order and the coils, the service department of the Westinghouse company was immediately organized to work in 24-hour shifts. The first set of new coils was sent by express to the striken territory on the next day, and another set the day after that. Personal tracers accompanied both consignments to keep the routes open, and traffic on the Causeway was restored in less than a week.

New Muscle Shoals Bid

Farmers' Federated Fertilizer Corporation to Offer $25.50 Rent per Kilowatt-Year

AS BRIEFLY reported in these columns two weeks ago, a new proposal for the lease of the government's properties at Muscle Shoals is to be presented to Congress when it reconvenes in December. C. Bascom Slemp, former secretary to President Coolidge, is the attorney for the new company, which, as previously stated, will bear the name of the Farmers' Federated Fertilizer Corporation.

The bill prepared for presentation to Congress in the interest of the new company provides that it shall issue 300,000 shares of preferred stock at $100 a share and 300,000 shares of common stock without nominal value. The corporation, says the bill, shall pay an annual rental for all of the leased property to be taken from the receipts from the sale of power, commencing with the calendar year following the placing in operation of Dam No. 2 with eight generating units, at the rate of $22.29 per kilowatt-year (8,760 kw.-hr.) for all primary power generated and sold by it from the power plants included, this rental to be raised to $25.50 when certain items of uncompleted work shall be finished. The corporation will pay rental at the same rate for all additional generating facilities (including 120,000 kw. which it proposes to install at Nitrate Plant No. 2), whether the completion of such facilities is financed by the government or the corporation. Under failure of the government to exercise its right of further power development within one year after notice by the corporation that such development is desirable, the corporation may undertake it, deducting from the gross rentals a yearly amount for amortization and interest charges.

Power needed for fertilizer manufacture is to be furnished by the corporation on as favorable a basis as power supplied to any other customer, but the corporation shall make no profit nor incur any loss through such manufacture. The corporation's rates shall be regulated by any state commission or other governmental body having jurisdiction, and under specified conditions it will build transmission lines and substations. A board of industrial development, a board of research and a farmers' board shall be set up as controlling agencies, the first to contain three representatives of the government and four of the corporation, the second and third to be appointed by the Secretary of Agriculture from bodies which are specified, and research, emergency, fertilizer and renewal and replacement funds shall be set up.

The following items of uncompleted work are to be carried to completion: (a) Changes and additions in the nitrate plants for use in the manufacture of fertilizer; (b) completion of Dam No. 2 with full equipment of eighteen generating units; (c) construction of Dam No. 3 with full power equipment and tie line to Dam No. 2; (d) additions to Nitrate Plant No. 2 to bring its capacity up to at least 120,000 kw.

The duration of the lease is to be fifty years, the corporation to have the right of primary consideration at the end of that period should the government determine to continue to rent the plants, and the government to have the right of recapture in the event of war.

Congressman Quin Still Favors Muscle Shoals Bill

Reports that Representative Quin of Mississippi has decided to withdraw his support from the Muscle Shoals bill of the joint congressional committee are without foundation. Mr. Quin has returned to Washington after four months in his district and is more certain than ever that the bill of the joint committee is in line with the desires of the people of his state. Mr. Quin is the ranking minority member of the House military affairs committee, which had the matter in charge, and therefore his attitude is important.

Novel Course at Princeton

Appeal for Laboratory Based on Its Educational Plan—Engineering and Cultural Study Combined

FUNDS are being sought by Princeton University for an engineering laboratory to house its School of Engineering, established in 1921, for which the existing provision is inadequate. Princeton is not endeavoring to set up another standard engineering school to compete with the well-established institutions now in existence. The university bases its appeal on the novel, if not unique, character of its engineering courses, which embody cultural along with fundamental technical studies in each year of a four-year course, reserving detailed engineering subjects for an optional fifth year. The cultural subjects have been cared for by requirements in English, modern languages and economics in the first two years and by a certain amount of elective freedom in non-engineering subjects in the two later years. Four-year courses are offered in civil, electrical, mechanical, chemical and mining engineering. By each of these courses graduates are prepared to take subordinate positions where fundamentals, but not detailed engineering preparation, are required. At the end of four years the degree of B.S. in engineering is given, while at the end of the fifth year the degree of civil engineer, electrical engineer, mechanical engineer and chemical engineer is given, a fifth year in mining engineering not being included.

The undergraduate course is adapted to those students who plan to enter upon business careers in which engineering knowledge and training are required, but who are not to become professional engineers themselves. It is the expectation of the engineering faculty that at least half of the graduates will return to Princeton for the fifth year. Others may desire to take a fifth year at another engineering school, and the four-year schedule at Princeton fits its graduates to enter the senior class of such institutions.

Power Commission News

Permits Authorized for Skagit and Okefenokee Projects—License for Big Pigeon River

THE Federal Power Commission has authorized a preliminary permit for the city of Seattle covering its proposed further development on the Skagit River in Whatcom County, Wash. The project is intended to utilize effectively the entire head of the Skagit River between the Canadian boundary and the city's constructed Gorge power house. The estimated capacity of the entire project is 260,000 hp., which is to be developed in three stages as the needs of the city require. The permit is to contain a provision that water must be stored in such a way as to prevent floods below the dam.

The commission also authorized the issuance of a preliminary permit to Ernest L. Hill and C. Lyman Spencer of Jacksonville, Fla., covering five sites on the Suwanee and St. Mary's Rivers. As already reported in these columns, it is planned to create a large storage reservoir in the Okefenokee Swamp, in south Georgia, in which both rivers have their source. About 40 miles of levees will have to be built. The plan calls for dams at Trail Ridge and Traders Hill on the St. Mary's and another near its mouth. Two dams are to be constructed on the Suwanee River, one near White Springs and the other near Branford. Power houses are to be built at each dam. No one of these projects taken separately is feasible, the commission's staff reports, but as a combined project there is a reasonable prospect of the whole system proving financially successful. The permit will contain conditions in the interest of navigation.

A license has been authorized for the Carolina Power & Light Company of Raleigh, N. C., covering the project previously noted on Big Pigeon River in Haywood County. The preliminary permit covering this project was issued March 4, 1924, to the Pigeon River Power Company, which turned it over to the licensee. It is proposed to construct a concrete arch dam 130 ft. high, to be raised later to a height of 180 ft. A conduit 6 miles long will carry water to the power house, where 35,000 hp. is to be installed initially and 70,000 hp. ultimately. The primary capacity of the project is 23,760 hp.

Licenses were authorized to cover the construction of an additional reservoir by the Sierra & San Francisco Power Company in connection with its project on the Stanislaus River, and for a small project on Bilk Creek in San Miguel County, Col., the applicant being W. R. Vanderveer, of Ophir, Col.

The Royal Development Company of Butte, Mont., has surrendered its license covering a small project in Chelan County, Wash.

A preliminary permit was authorized for A. A. Shuford and F. M. Laxton of Charlotte, N. C. The permit covers a project on Wilson Creek, in Caldwell County, N. C., where it is proposed to construct a dam 250 ft. high with a conduit leading to the power house one

mile down stream. The primary power available is 3,070 hp.

The preliminary permit of A. T. Seybold for a project on Klamath River has been extended until Aug. 7, 1927. The permit of the Electro Metals Company of San Francisco for a project on the same river has been extended until Aug. 7. An extension until Oct. 25, 1927, has been allowed the city of Sacramento for its proposed development on Silver Creek in the South Fork of the American River. A similar extension has been granted the El Dorado Company on its Placerville project.

The Federal Power Commission has rejected the application of the Tongass Power & Light Company for a preliminary permit covering a power project on the Salmon and Soule Rivers in Alaska.

The South Branch Power Company, Philadelphia, has applied for a preliminary permit for three dams on the Cacapon River and four dams on the South Branch of the Potomac River, in Morgan, Hampshire, Grant and Hardy Counties, West Virginia. The power is desired for public utility purposes.

E. G. Salt of San Francisco has applied for a license covering a small diversion from Deer Creek for his Glen Alpine plant.

In a report to the commission the Chief of Engineers approves of the plan of power development at Dams Nos. 9, 12 and 15 on the Cumberland River.

The commission holds that the proposed development of the Guadalupe Power Company of Seguin, Tex., in the Guadalupe River, near New Braunfels. comes within the purview of the water-power act. A project of the Silver Hill Power Company on Fish River, 4 miles above Silver Hill landing, was found not to come within the purview of this act.

Year's Hydro Licenses Total 1,220,000 Hp. Ultimate

Of the 3,866,000 hp. which has been placed under license since the enactment of the federal water-power act in 1920, nearly 35 per cent was put under construction during the last fiscal year. The projects licensed in that period and their ultimate installations are as follows: Susquehanna Power Company and Philadelphia Electric Power Company, Susquehanna River, 473,000 hp.; Alabama Power Company, Lock 18, Coosa River, 180,000 hp.; Nevada Irrigation District, Yuba River, 150,000 hp.; Louisville Hydro-Electric Company, Ohio River, 135,000 hp.; Mount Shasta Power Company, Pit River plant No. 4, 100,000 hp.; San Joaquin Light & Power Company, Kings River, 65,000 hp.; Feather River Power Company, Feather River, 60,000 hp.; Pacific Gas & Electric Company, Mokelumne River, 42,000 hp.; various small projects, 15,000 hp. This makes a total of 1,220,000 hp. The record of the fiscal year also is notable for the fact that the installed capacity of the projects east of the Mississippi River is nearly double that of the projects west of the river which have been licensed.

Briefer News

Healdsburg, Cal., Refuses to Give Up Its Electric Plant.—The City Board of Healdsburg, Cal., has announced its opposition to relinquishing the municipal light and power plant under any conditions. The announcement was called forth by a report that a large central-station company was desirous to negotiate a lease of the electric plant in return for which it would undertake to supply the city with gas.

Decision on Laclede Gas Company Valuation Expected Soon.—The Missouri Public Service Commission will soon hand down its decision in the Laclede Gas Light Company valuation case. It is anticipated that it will decide that for rate-making purposes the company's holdings have a valuation of approximately $55,000,000. The company, which does an electric as well as a gas business, has contended for a valuation exceeding $74,000,000, while experts testifying for the city of St. Louis pared this down to $40,000,000.

Ten-Day Public Celebration for Kearny Station.—No less than ten days is to be devoted to the celebration of the completion, as already noted in these columns, of the first half of the Kearny (N. J.) electric power station of the Public Service Electric & Gas Company. Tuesday, Nov. 9, has been set aside for public officers, engineers and leading representatives of the electric industry in the state and throughout the country; Nov. 10 and 12 for Public Service security holders; Nov. 15 for industrial power users, manufacturers and others particularly interested in power matters; Nov. 16 and 17 especially for women; Nov. 18 and 19 for the general public, while on Sautrday, Nov. 13, and Saturday, Nov. 20, employees of all Public Service companies will be received.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see ELECTRICAL WORLD, July 3, page 50.]

National Association of Railroad and Utilities Commissioners—Asheville, N. C., Nov. 9-12. J. B. Walker, 270 Madison Ave., New York.

American Engineering Council—Administrative board, Ithaca, N. Y., Nov. 11 and 12. L. W. Wallace, 26 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers — Regional meeting, New York, Nov. 11-12. F. L. Hutchinson, 33 West 39th Street, New York.

National Electrical Credit Association—Philadelphia, Nov. 12; New York, Dec. 7; Boston, Jan. 18. F. P. Vose, 1008 Marquette Bldg., Chicago.

Empire State Gas and Electric Association — Electric Meter Section, Hotel Seneca, Rochester, Nov. 15 and 16. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society — Buffalo, Nov. 16-19. M. M. Kelly, 29 West 39th Street, New York.

American Society of Agricultural Engineers, Farm Power and Machinery Division—Chicago, Dec. 1 and 2. Raymond Olney, St. Joseph, Mich.

American Society of Mechanical Engineers—New York, Dec. 6-9. C. W. Rice, 29 West 39th St., New York.

Northwest Association of Electrical Inspectors—Multnomah Hotel, Portland, Ore., Jan 18 and 19. F. D. Weber, Box 745, Portland.

A College Course in Tree Trimming.—The damage sometimes done to trees by the stringing of electric wires has been so much discussed that the New York State College of Forestry at Syracuse University is offering to linemen a course of instruction in tree trimming. The course was started through the efforts of the Empire Gas and Electric Association. It will consist of lectures and discussions, supplemented by field trips for the study of actual conditions and demonstrations in tree pruning. In addition, the course, which will extend from Nov. 15 to Nov. 20, will include a study of tree culture.

Rochester Company to Install New Hydro-Electric Unit. — The Rochester (N. Y.) Gas & Electric Corporation is planning to spend $1,100,000 for additional water-power development at its Station No. 5, at the Lower Falls of the Genesee River. The project involves a 20,000-hp. turbine and a 75-ft. extension of the present building, erected in 1914. The new unit will be the largest in the company's system, and will increase its electrical output by 22,000,000 kw.-hr. a year. Work will start immediately, and it is expected that the new unit will be ready for service by the fall of next year.

Reading Railway Contemplates Electrification.—That the Reading Company, which has an extensive railroad system in Pennsylvania and New Jersey, is maturing electrification plans was indicated last week when Charles E. Ewing, vice-president, stated that a comprehensive survey of its suburban lines is being made by engineers from the Westinghouse and General Electric companies, together with the railway's own engineers. A report is expected in three months, Mr. Ewing said, adding: "The task is gigantic, involving millions in expenditures and serious engineering problems. The matter of grade crossings is one of the most serious."

Negotiations for Municipal Plants in Virginia Continue.—Agreement is reported between representatives of the city of Danville, Va., and officials of the Appalachian Power Company relative to terms under which the corporation would operate the city's electric and gas plants if a sale were to be made. The committee is now prepared to report the full terms to the City Council, which is expected to vote favorably on the sale and refer it to public vote. It is apparent that if the Appalachian company does not go to Danville, it will skirt the city line, offer power to suburban settlements and head off in the direction of Roxboro, N. C., where contact is to be made with the Carolina Power & Light Company. The Appalachian Power Company has also

offered the town of Martinsville, Va., $250,000 for its hydro-electric plant on Smith River and its distribution system. A committee of the Town Council has been appointed to make a report on the offer, and, if it is approved, a public referendum will be held.

Chippewa Falls Distribution System Valued. — When the citizens of Chippewa Falls voted in May, 1925, in favor of taking over the electric distribution system of the Northern States Power Company controversy over the purchase price was referred to the Wisconsin Railroad Commission. Under a decision handed down on Oct. 20 the commission has fixed the price at $167,000, exclusive of all materials and supplies on hand. The decision further provides that the city shall purchase power from the company, at a rate to be fixed by the commission, for a period of not less than two years after acquiring the system and shall give one year's notice if it wishes to discontinue buying its power. The company valued the system at approximately $200,000.

Los Angeles Bureau of Power and Light to Spend $11,000,000.—In accordance with the decision of the voters as expressed emphatically at the poles on Aug. 31, Los Angeles is to issue $21,000,000 in bonds for the use of the water and power departments. The Bureau of Power and Light will receive $11,000,000 of this sum, which is to be spent for the development of 28,000 hp. of additional hydro-electric energy along the Owens River Aqueduct, for the acquisition of rights-of-way and construction of tower lines and two additional electric stations as a part of a high-voltage transmission system which ultimately will include the city, and for the purchase of privately owned electric distribution lines in recently annexed districts.

Expansion of United Light & Railways Company.—A 25-mile transmission line between Omaha, Neb., and Missouri Valley, Iowa, has just been erected by the United Light & Railways Company as a step in an interconnected loop system of the Nebraska Gas & Electric Company and the Iowa Service Company. This loop, with Omaha as its center, will serve a territory reaching from Norfolk, Neb., and Dunlap, Iowa, on the northeast, to Red Oak and Malvern, Iowa, on the southeast. Another undertaking to be executed by the company in the near future is a 66,000-volt substation at Plattsmouth, Neb., which will be connected with lines from Lincoln and Omaha and from Malvern, Iowa.

One Unit of Gulf State Station at Neches, Tex., Finished.—At a cost of approximately $4,000,000 a 25,000-kva. turbo-generator, the first of five units that are to compose the power station of the Gulf States Utilities Company on the Neches River on the outskirts of Beaumont, Tex., has just been finished. Construction of the second unit will be started soon, it is believed. The total cost of the power enterprise of the company will, it is estimated, reach $17,000,000. The Gulf States Utilities Company, which has its headquarters at Orange, Tex., is one of the Texas operating companies owned by the Stone & Webster Engineering Corporation of Boston. The new station is to have an ultimate capacity of 300,000 kw. The boilers are equipped to burn either natural gas from the fields north of Beaumont or fuel oil from the company's supply tanks, which at present will be used only in case of emergency, and, if more economical, pulverized coal may be burned by installing the proper equipment.

A 2,000-Watt "Eveready."—The "biggest flashlamp in the world" is a feature of the exhibit at the Sesquicentennial Exposition of the National Carbon Company, Inc., makers of "Eveready" flashlamps and radio bat-

teries. This flashlamp, measuring 6½ ft. in length and 2½ ft. in diameter, is an exact working reproduction, on a gigantic scale, of one of the popular models manufactured by the company. It is energized from the electric lighting system of the exposition and has a 2,000-watt lamp.

Notable Automatic Hydro-Electric Station. — A single-unit automatic hydro-electric generating station of unusual size is being erected on the Elwha River, 11 miles from Port Angeles, Wash., by the Northwestern Power & Light Company. This station, to be known as the Glines Canyon power house, will furnish power for the operation of the Washington Pulp & Paper Company's plant at Port Angeles. It will probably go into operation early in 1927. A single-arch dam is being constructed, approximately 190 ft. high, forming a reservoir which will impound about 40,000 acre-ft., the drawdown from about half of which will be used in generating electricity. The power house will be approximately 800 ft. downstream from the dam and on the western bank of the river at the mouth of a gorge. The water will be conducted from the dam to the power house through a tunnel 575 ft. in length. The generating equipment will consist of a 17,500-hp., vertical-shaft Francis turbine furnished by the Pelton Water Wheel Company, driving a 13,333-kva., alternating-current, 6,600-volt, three-phase, 60-cycle, 225-r.p.m., 90 per-cent-power-factor, vertical generator with directly connected exciter. This generator and all the other electrical equipment will be of General Electric manufacture, including three 4,500-kva. outdoor-type transformers and necessary switching equipment. The automatic equipment will control and protect both the main unit and a 62.5-kva. auxiliary waterwheel and motor-driven oil-pump unit. By means of selector supervisory equipment the operator at the Elwha station, 7 miles distant, will give starting and stopping indications and supervise the running of the automatic plant.

Worcester Merger Plans Heard at Boston.—An all-day hearing upon the proposed merger of the Worcester Electric Light Company and the Worcester Gas Light Company took place last week before the Massachusetts Department of Public Utilities, and at its close the commission took the matter under advisement. Violent newspaper attacks upon the former company during the past few weeks have been followed by petitions for rate reductions in both electric and gas fields. It was brought out at the hearing that, although the electric light company is one of the most prosperous in the state, its rates are among the lowest charged by Massachusetts light and power companies. Chairman Henry C. Attwill of the commission commended the company's treatment of the public.

High Transmission Towers Under Way.—In order to comply with the government's requirements for clearance of navigable steamers, it will be necessary for the Pacific Gas & Electric Company to build five towers ranging in height from 269 ft. to 459 ft. to carry its new 220,000-volt transmission lines across the Sacramento and San Joaquin Rivers. Two of these towers will be required to cross the Sacramento and three to cross the San Joaquin. The tallest tower in the latter span will be 359 ft. Six copper-clad steel cables without a splice will stretch from anchorage to anchorage across these rivers, the span across the Sacramento being 7,029 ft. and that across the San Joaquin 8,835 ft. In order to maintain the height of the wire above the river, intermediate supporting towers are being built, so that the longest unbroken span across the Sacramento will be 4,125 ft. and that across the San Joaquin 3,175 ft. Unusually high towers for transmission lines in New England will be those which are now being constructed by the Edison Electric Illuminating Company of Boston for the Weymouth Fore River crossing from the new Edgar station on the transmission line which is being erected southward to the town of Bellingham. These towers will be 277.8 ft. above their foundations, or about 295 ft. above mean low water. The total length of the crossing above the river will be 4,000 ft. in two spans of 2,000 ft. each, and the wires at their lowest point will be 150 ft. above high water.

Men of the Industry

Hellmund and Dudley of Westinghouse Organization Promoted

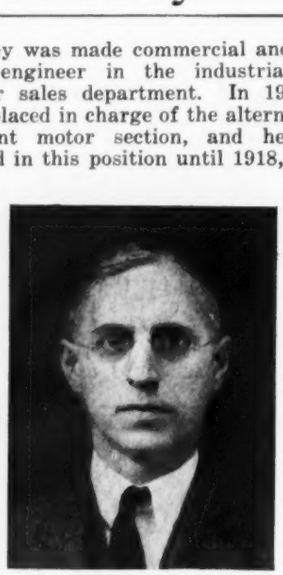
R. E. Hellmund, formerly engineering supervisor of development of the Westinghouse Electric & Manufacturing Company, has been appointed to the newly created office of chief electrical engineer, and A. M. Dudley, formerly manager automotive equipment engineering department, has been appointed engineering supervisor of development, the position left vacant by Mr. Hellmund's promotion. Mr. Hellmund's activities in his new position will be principally in connection with electrical development work to assure the adequacy and progressiveness of designs and to co-ordinate this work properly throughout the different engineering departments. In the capacity of engineering supervisor of development Mr. Dudley will be responsible for all central activities of the engineering department in connection with the development budget and program of the electrical group.

Mr. Hellmund is known in the electrical and allied industries for his inventive genius and his work on the design of new and improved electrical apparatus, holding almost 300 patents taken out in the United States and abroad. He entered the employ of the Westinghouse Electric & Manufacturing Company in 1907 as a designer of induction motors. Later he was engaged in general engineering work and, in 1912, was placed in charge of the design of all direct-current and alternating-current railway motors. In 1917 he was assigned to do miscellaneous

R. E. HELLMUND

consulting work, which he continued until 1921, when he was appointed engineering supervisor of development. He continued in this capacity until his recent promotion.

A graduate of the University of Michigan, Mr. Dudley entered the Westinghouse company as an apprentice in 1904 and soon afterward received a position in the engineering department, where he was engaged in the design of alternating-current motors and controllers. Early in 1906 Mr. Dudley was made commercial and general engineer in the industrial and power sales department. In 1907 he was placed in charge of the alternating-current motor section, and he continued in this position until 1918, when



A. M. DUDLEY

he was placed in charge of the design of starting, lighting and ignition equipment for automobiles. In 1920 he was made manager of the automotive equipment engineering department, a post he held until 1924, when he was appointed to assist Mr. Hellmund in his work as engineering supervisor of development. Mr. Dudley has taken out numerous patents on the details of construction of electric machinery. He is the author of "Connecting Induction Motors," which is recognized as an authoritative textbook on the subject. He is a fellow of the American Institute of Electrical Engineers and past-chairman of the Pittsburgh Section of that organization and is a member of the American Society of Automotive Engineers.

Dr. Humphreys Resigns

Dr. Alexander C. Humphreys, president of the Stevens Institute of Technology, Hoboken, N. J., for nearly 25 years, tendered his resignation Oct. 21 to the trustees. Dr. Humphreys is nationally known in engineering circles not only as an educator but as chief executive of gas and electric lighting companies, which in the course of his professional career numbered more than fifty. A native of Edinburgh, Scotland, Dr. Humphreys removed to America at an early age. His first business affiliations were with insurance companies in Boston and New York, but subsequently he entered the public utility field. Connections with the Bayonne & Greenville Gas Light Company, the Pintsch Lighting Company of New York, the United Gas Improvement Company and the firm of Humphreys & Glasgow, engineers, London and New York, followed. In the meantime Dr. Humphreys had become a student at Stevens and was graduated in 1881. He became the institute's second president in 1902 and president of the board of trustees in 1907. He has contributed frequently to engineering literature and has been active in association work, being a past-president of the American Society of Mechanical Engineers, a fellow of the American Institute of Electrical Engineers and a member of the American Society of Civil Engineers and the American Institute of Mining and Metallurgical Engineers. Dr. Humphreys will remain in office until the completion of his twenty-fifth year, June 5, 1927.

H. C. Blackwell Becomes President of Cincinnati Utility

H. C. Blackwell, for more than two years vice-president of the Union Gas & Electric Company, Cincinnati, in charge of operations, has been made president of the company to succeed W. W. Freeman, who becomes chairman of the board of directors. Mr. Freeman has relinquished the duties of chief executive after ten years of service because of the enlarged responsibilities which the recent merger of the Columbia Gas & Electric Company with the Ohio Fuel Corporation has thrown upon him as a vice-president of the Columbia organization. Mr. Blackwell is known throughout the country in the electric light and power field, having been president of the Missouri Association of Public Utilities and one of the active leaders of the National Electric Light Association.

For six years prior to his connection with the Union Gas & Electric Company, Mr. Blackwell had been vice-president and general manager of the Kansas City Power & Light Company, having charge of construction and operations. In this capacity he was closely identified with the Kansas City

H. C. BLACKWELL

development, which proved to be one of the most successful of the larger electric enterprises in the country. His early experience included connections with the Wabash Railroad Company, J. G. White & Company and with the People's Light Company at Davenport, Iowa. In the last-named company he advanced from engineer to the position of vice-president and general manager.

C. W. DeForest, who has been connected with the Union Gas & Electric Company, supervising the designing

and construction of the company's power houses, has been promoted to a vice-presidency. **P. G. Vondersmith,** who was assistant to the general manager, has been named assistant general manager.

M. A. Pooler, vice-president and general manager of the New Brunswick Power Company, St. John, N. B., has resigned to accept a public utility post in the United States. His position will be filled by W. H. Swift, Jr., who has been associated with the Westinghouse Electric & Manufacturing Company.

L. C. Hitzeroth has become affiliated with the Delta-Star Electric Company, Chicago, where his broad experience in the public utility field will make him a valuable addition to the engineering staff. For the past three years he has been connected with the engineering department of the Public Service Production Company of Newark, N. J., and previous to that connection he was with the Southern Sierras Power Company and the Great Western Power Company for many years. Mr. Hitzeroth is a native Californian and a graduate of the University of Nevada.

Obituary

Judge William Hamilton Felton, president of the utility companies at Macon, Ga., died suddenly Oct. 19 in his sixty-seventh year. Mr. Felton was one of the best-known citizens of central Georgia. At one time he was dean of the law school at Mercer University and later served as judge of the Bibb County Superior Court. For many years he had been president of the Central Georgia Power Company and the Macon Railway & Light Company.

Isaac Elkas, special fan representative for the Wagner Electric Corporation of St. Louis, died Oct. 15 at his father's home at Leota Landing, Miss. Mr. Elkas was well known to the electrical trade, was a graduate of the University of Illinois, for three years was district manager of the Sprague Electric Company of St. Louis and for twelve years was district manager of the St. Louis and Chicago offices of the Robbins & Myers Company.

John A. Prouty, one of the best known public utility operators in northern New England, died recently of typhoid fever. Mr. Prouty was formerly president of the Bradford (Vt.) Electric Light Company and at the time of his death was president and general manager of the Newport (Vt.) Electric Light Company. He was about 36 years of age and was a son of the late Charles A. Prouty, at one time chairman of the Interstate Commerce Commission. John A. Prouty retired from the Bradford company a few months ago upon its sale to the Insull interests.

Thomas P. Ireland, electrical engineer in the service of the Hollinger Consolidated gold mine of Porcupine, Ontario, died of exposure Oct. 19, while on a duck-hunting expedition at Gold Lake in company with Ernest Tate, also employed by the Hollinger. Alarmed at their continued absence from camp, a companion set out in search of them and discovered their bodies lying across their upturned canoe. Mr. Ireland, who was 37 years of age, was born in Hamilton, Ontario, and in 1915 was graduated from the University of Toronto with the degree of B. Sc. After practicing his profession in Hamilton he received the appointment of electrical engineer at the Hollinger, seven years ago.

John Fredholm, distinguished Swedish engineer, died in Stockholm Aug. 12. Mr. Fredholm had been for sixteen years with the Swedish General Electric Company of Vesteras and since 1919 had been managing director of the A.-B. Skandinaviska Elektricitetsverket, Stockholm.

Recent Court Decisions

Municipality Held to the Same Standards of Integrity as Individuals.—The Nebraska Supreme Court has ordered the village of Oshkosh to pay to Robert C. Wood, a contractor who built its electric lighting plant, the sum of $10,682, balance due. In deciding the controversy the Supreme Court said that in Nebraska it is no longer an open question that villages have both governmental and proprietary or business powers and that the furnishing of a municipal utility is within these latter powers. That being true, a municipality will be held to the same business integrity that the law requires of any other corporation. There is no legal reason, it added, and certainly no moral reason, why municipal corporations should be permitted to reap the benefits of a fully completed contract and escape liability under a technical plea. Oshkosh had been served by a small private plant which the citizens voted to purchase and reconstruct. Bonds were issued to the limit, and then city warrants, which were later to be taken care of by a refunding bond issue, were authorized by the municipal authorities. Although when the legality of this procedure was tested in the courts the issue of city warrants was enjoined, the village board notwithstanding told Wood to go ahead and complete his contract. Then, according to testimony, the municipal authorities sought to escape payment by claiming that what was done was beyond the corporate powers of the village.

Disposition of Surplus Earnings from Hetch Hetchy Plant.—Uhl vs. Badaracco was a suit over the disposition by the city of San Francisco of surplus funds accruing by reason of payments made to the city by the Pacific Gas & Electric Company for energy distributed by that company over its system. The California Supreme Court issued a peremptory writ of mandate, holding that such funds could not be employed to make extensions and improvements until after the interest and sinking-fund requirements had been provided. The court concluded a long argument as follows: "To the suggestion of respondents that it is extremely important in the operation of a municipal project that the surplus revenue be used at times to make ordinary extensions and improvements to the system, to keep pace with the growing demand, it is sufficient to say that the extensions here contemplated are not ordinary, involving as they do the alleged expenditure of nearly two million dollars. The charter provides in what manner such extensions may properly be made. It is for the voters to say whether they are ready at this time to assume the costs of such extension. As stated by petitioner, it would seem to be a useless expenditure of funds in the absence of a distributing plant, the acquisition or construction of which, considering its enormous cost, might possibly never be sanctioned by the taxpayer. However this may be, the power plant being but an incident of the water project, its extension under the circumstances must be provided for by a bond issue with the approval of the taxpayers, there being insufficient surplus earnings after satisfying the charter requirements to pay for such extensions. Any other conclusion would circumvent the express mandatory requirements of the organic law of the city. This being so, there is not authority in respondents to make the contemplated expenditure at this time, as surplus earnings of a public utility cannot be employed to make extensions and improvements until after the interest and sinking-fund requirements have been provided for."

Commission Rulings

Allowance for Organization Expense in Valuation.—The right to an allowance for organization expense was considered by the Idaho Public Utilities Commission in a case affecting the Salmon River Power & Light Company, and the commission said: "In valuing the property of a public utility an allowance should be made for organization, which is a value attaching thereto, resulting by reason of such organization. The term 'organization' means more than merely the ordinary processes of forming or organizing a corporation. Before a corporation is organized, individuals must conclude to form such organization after the proposed field has been carefully looked over and canvassed, in order to obtain the facts necessary to determine whether the venture would be successful or otherwise. Plans have to be formulated and detailed preliminaries carefully gone into before organization, and in case it is concluded to organize a corporation under the laws of a state to render public service, the individuals composing the same are obliged either to stand ready to invest their own money or to seek and obtain capital elsewhere. The amount of the expense and value thereof are conditioned to some extent upon the location of the territory in which the utility is to function."

Financial and Corporate

Market Is Steady and Firm

But Very Little Activity Is Recorded During Week—No Important Price Changes

ONE of the most interesting features of the week, affecting the markets in general and reflecting the state of business, was the publication of the earnings statements of the country's two leading industrial concerns, General Motors and United States Steel. Nine months' earnings of the former showed an 83 per cent gain over last year, and a gain of almost 40 per cent was shown for the Steel company. The opinion is fairly general that this creditable showing represents a discounting of fall business as reflected in the strength of these stocks. Even if such be the case, their continued strength shows general confidence in the continuance of those factors in business and industry which have made such a showing possible—at least for the immediate present. This has a bearing on the power and light industries.

There has been no outstanding movement either one way or the other in the markets for public utility securities. Demand has been quite limited and there is no very great supply offering. The result is a small volume of trading. Expectations in certain quarters that some securities would be depressed as a result of criticism of the industry by Professor Ripley of Harvard have not been borne out. There have been just as many gains as losses during the week, and certain issues which came in for criticism in the *Atlantic Monthly* article have been among the strongest.

Very few price changes either among common or preferred issues are worth recording. American Gas & Electric common made a substantial gain to 107¼ and reacted to around 104. Cities Service was also among the gains. The bond market remains more or less featureless.

Malone Utility Increases Capital.—The Malone (N. Y.) Light & Power Company has filed a certificate in the office of the Secretary of State increasing its capital stock from 18,000 shares, consisting of 3,000 shares preferred stock $100 par value and 15,000 shares common stock no par value, to 33,000 shares, consisting of 3,000 shares preferred stock $100 par value and 30,000 shares common stock no par value.

Customer Sales Reach $19,000,000 in August

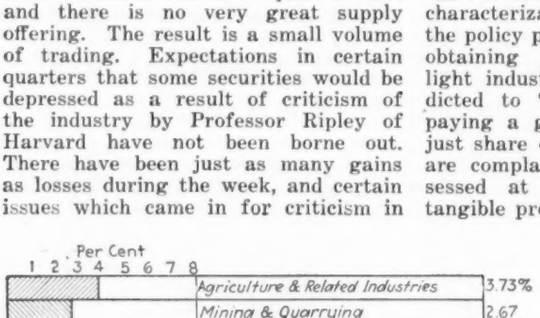
Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to their customers and employees, it is estimated that during August a total of 264,000 shares were sold in this manner. The value of the stock sold is estimated at $19,000,000. A total of 25,000 customers took part in the sales during August.

Power and Light Companies Overtaxed

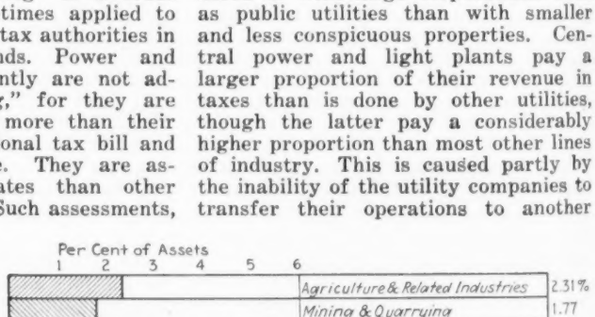
Pay Largest Proportion of Revenue Toward Country's Tax Bill, Although Return on Capital Is Much Smaller than in Other Lines of Industry

BY H. M. CAMERON
Financial Editor

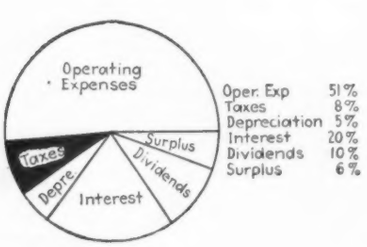
TO "PLUCK the most feathers with the least squawking" is a crude characterization sometimes applied to the policy pursued by tax authorities in obtaining public funds. Power and light industries evidently are not addicted to "squawking," for they are paying a great deal more than their just share of the national tax bill and are complaining little. They are assessed at higher rates than other tangible properties. Such assessments, moreover, are usually more rigidly adhered to with large corporations such as public utilities than with smaller and less conspicuous properties. Central power and light plants pay a larger proportion of their revenue in taxes than is done by other utilities, though the latter pay a considerably higher proportion than most other lines of industry. This is caused partly by the inability of the utility companies to transfer their operations to another


Per Cent
1 2 3 4 5 6 7 8
Agriculture & Related Industries 3.73%
Mining & Quarrying 2.67
Manufacturing 1.75
Construction 1.00
Transportation & Other Utilities 5.92
Power & Light Plants (Privately Owned) 7.41
Commerce 0.87
Banking, Finance etc. 4.77

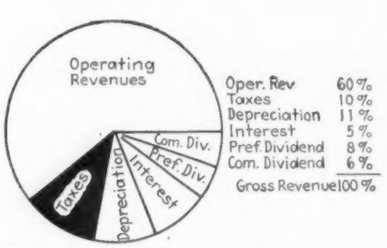
Power and light utilities contribute much larger proportion of gross earnings to national tax bill than any other group.
(From data compiled by National Industrial Conference Board)



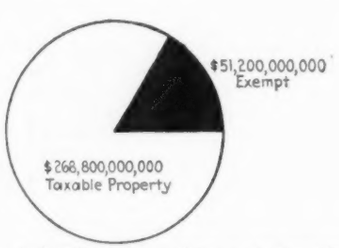
Public utilities contribute much larger portion of their assets in taxes than any other group.
(From data compiled by National Industrial Conference Board)



Distribution of gross revenues of an Eastern Utility



Taxes turned a surplus into a deficit in this company.
Distribution of gross revenues of a Pacific Coast Utility



Industries which pay taxes must pay an abnormally large share since 16 per cent of all wealth in U.S. is exempt. (Tax exempt securities are said to reach an aggregate of $30,000,000,000)

COMPARISON OF TAX BILL OF POWER AND LIGHT COMPANIES WITH THAT OF OTHER INDUSTRIES AND PROPORTION OF EARNINGS PAID ANNUALLY IN TAXES

TABLE I—REVENUE AND TAXES OF ALL CORPORATIONS IN UNITED STATES—1923
(Source, United States Bureau of Internal Revenue)

	Per Cent Taxes to Gross Receipts			Per Cent Taxes to Net Revenue		
	Income and Profits	Other	Total	Income and Profits	Other	Total
Agriculture and related industries	1.26	2.47	3.73	14.97	29.24	44.21
Mining and quarrying	0.63	2.04	2.67	22.07	71.18	93.25
Manufacturing	0.86	0.89	1.75	11.01	11.38	22.39
Construction	0.51	0.49	1.00	12.87	12.37	25.24
Transportation and other public utilities	1.43	4.49	5.92	7.97	25.01	32.98
Trade	0.40	0.47	0.87	11.33	13.40	24.73
Public service, professional amusements, hotels, etc.	0.84	1.85	2.69	11.02	24.20	35.22
Finance, banking, insurance	1.09	3.68	4.77	7.34	24.86	32.20

TABLE II—REVENUE AND TAXES OF CLASS I RAILWAYS IN UNITED STATES—1923-24
(Source, official summaries by Interstate Commerce Commission published by Bureau of Railway Economics)

	1923	1924
Operating revenues	$6,289,580,000	$5,921,490,000
Other income	260,655,000	272,989,000
Gross receipts	6,550,235,000	6,194,479,000
Net income (after taxes)	554,995,000	562,303,000
Taxes	331,915,000	340,337,000
Net profits (before taxes)	886,910,000	902,640,000
Percentage:		
Taxes to gross receipts	5.07	5.49
Taxes to net profits	37.42	37.70

TABLE III—REVENUE, PROFITS AND TAXES OF CENTRAL ELECTRIC LIGHT AND POWER STATIONS
(Source, United States Bureau of Commerce, 1922)

	Commercial	Municipal	Total
Total revenue (including estimated value free service)	$986,684,000	$85,436,000	$1,072,120,000
Total expenses (including depreciation and taxes)	787,432,000	64,877,000	852,309,000
Net income after taxes	199,252,000	20,559,000	219,811,000
Taxes	73,128,000	645,000	73,773,000
Net profits before taxes	272,380,000	21,204,000	293,584,000
Percentage:			
Taxes to gross receipts	7.41	0.75	6.88
Taxes to net profits	26.85	3.04	25.13

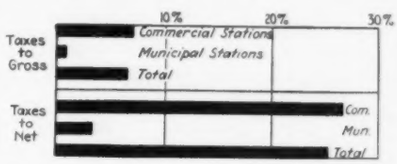
part of the country and partly by the fact that 16 per cent of the total wealth of the United States is exempt from taxation. The taxable balance must pay a heavier toll. The public must be educated to the unfairness of the situation as a first attempt toward bringing about more equitable distribution of the tax burden.

The fact that the power and light companies must have a much larger capital invested in relation to their earnings than most other industries would seem sufficient handicap in itself. Rather than receiving consideration on these grounds, the very existence of their large properties leads to their being charged higher taxes than most other industries. The property factor rather than the income factor dominates. The unfairness of this is evident but has received remarkably little public attention. A study recently completed by the National Industrial Conference Board shows startling results in this regard.

Its analyses of statistics compiled by the United States Bureau of Internal Revenue show that in 1923 that group of companies comprising transportation and other public utilities expended 5.92 per cent of gross receipts for taxes—a larger proportion than that of any other industrial group, the average for all corporations being only 2.16 per cent. If taxes other than federal, income and profits taxes be considered by themselves, the percentage of gross receipts for transportation and other public utilities is 4.49, which is again much higher than the proportion for any other industrial division. Light and power corporations that operated at a profit, excluding transportation and other utilities groups, contributed 6.09 per cent of gross receipts for taxes—a greater percentage than that for any other group.

Proceeding by the process of elimination, let us rule out the transportation agencies. As already stated, the group contributed 5.92 per cent of gross in 1923. Official statements of the Interstate Commerce Commission, as published by the Bureau of Railway Economics, showed that steam railways in the United States disbursed 5.07 per cent of their gross receipts in taxes in 1923 and 5.17 per cent in 1922. Since these percentages are somewhat smaller than those for transportation and public utilities combined, and since steam railways overshadow all other transportation systems in importance, it follows that the percentage of gross receipts of public utility corporations expended for taxes must be greater than the proportion for the combined group mentioned above. Otherwise expressed, the conclusion already drawn that these corporations in the transportation and public utilities group disburse a greater share of their gross receipts than the average for any other major industrial group is true by even a greater margin for public utility corporations considered by themselves.

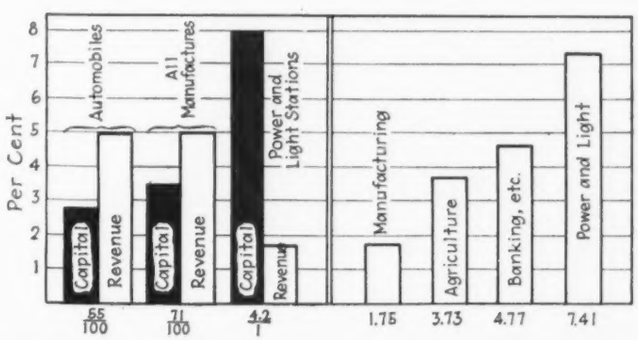
Further evidence of the accuracy of the above statement as regards electric light and power industries is gleaned from the United States Census of Electrical Industries taken in 1922. According to statistics there presented, the central light and power stations disbursed in 1922 an average of 6.88 per cent of gross earnings in taxes. Municipal plants, generally exempt from taxation, paid only 0.75 per cent of gross income, while privately owned utility plants paid 7.41 per cent. For the same year central light and power stations paid 26.85 per cent of net revenue for tax disbursement.



PROPORTION OF GROSS AND NET EARNINGS PAID IN TAXES

The same result is shown from a study made by the ELECTRICAL WORLD of ten representative companies, reports of which show that taxation took an average of 7.1 per cent of gross revenues and 18.4 per cent of net. Among the companies chosen one showed taxes of 10.7 per cent of gross revenue and 29.6 per cent of net. Another showed taxes amounting to 10 per cent of gross and 26 per cent of net. These companies were in widely separated sections of the country. One company which reported a deficit for the year paid 9.5 per cent of gross and 23 per cent of net in taxes.

There are probably various reasons for this apparently unfair impost upon power and light companies. In the first place, they are immobile. Properties of this nature cannot change their location at will, and there are therefore possibilities of assessing the special kinds of properties owned by public utilities at unusually high rates. Executive attention in these industries has been directed to this problem for some time, but a solution has not yet been found. There is at least one general factor affecting all taxable properties; that is, the large volume of



CAPITAL TURNOVER SLOWER IN POWER AND LIGHT COMPANIES THAN IN OTHER INDUSTRIES. SECOND HALF OF CHART SHOWS PERCENTAGE OF GROSS REVENUE PAID IN TAXES

untaxed property. It is estimated that the total wealth of the United States is not far from $320,000,000,000, of which more than $50,000,000,000, or about 16 per cent, is entirely or partly exempt. Approximately 60 per cent of the exempt amount is stated to be in securities, while the balance is in real estate and other properties publicly owned or belonging to educational or other institutions. As urged by Nash in "Economics of Public Utilities," the effect of this huge volume of exemption is to make the rate of those who pay taxes at least 10 per cent higher than if all except government-owned properties were taxed. Public utilities are also subjected to business licenses, income taxes, capital-stock taxes and additional imposts similar to those of other business corporations, but, in addition, utilities are subject to assessments and imposts of a special character to which general business is not subject or is subject only to a restricted degree. The whole problem is one which demands executive attention with a view to securing a greater degree of uniformity in taxes of all corporations.

Executive attention has been directed to this problem in the past in a general way, but little has been done in the way of placing before the public a vivid picture of the unfairness of the present tax situation. The only way to gain public sympathy and support in attaining this result is the presentation of accurate and convincing evidence that the situation is as stated. The light and power utilities are glad to pay their proportionate share of taxes and the facts quoted merely call attention to an unfair distribution of these taxes.

New Capital Issues Offered on Large Scale

During the week ended Oct. 28 several new electric light and power issues of sizable amounts were offered. The Alabama Power Company contributed $6,000,000 to the total in the form of first mortgage lien and refunding gold bonds, priced at 98½ and interest, to yield about 5.10 per cent. These 5 per cent bonds were dated Nov. 1, 1926, to mature Nov. 1, 1956. In addition to being secured by a general mortgage on the entire property of the company, these bonds are secured by the pledge of $39,302,000 of its first mortgage 5 per cent bonds and $1,276,000 (closed mortgages) underlying divisional bonds. No additional first mortgage bonds, of which $10,221,000 are now outstanding with the public, can be issued except for pledge as further security for the first mortgage lien and refunding bonds.

With the purpose of retiring outstanding bonds the Central Maine Power Company floated a three-million-dollar issue of first and general mortgage gold bonds, series D, the price being 100 and interest, yielding 5 per cent. These bonds are dated July 1, 1925, and fall due July 1, 1955. They are secured by a first mortgage on the electric, gas and railway properties in Rockland, Thomaston and Camden, together with certain local distributing systems in other communities and on real estate controlling valuable undeveloped water-power sites, and also by a mortgage on the entire remaining physical property of the company subject to $4,379,000 first mortgage and $500,000 other divisional lien bonds. Net earnings of the Central Maine company for the year ended Sept. 30, 1926, totaled $2,093,106, or two and seven-eighths times annual bond interest charges.

A short-term offering of 5½ per cent

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Oct. 26	Low 1926	High 1926
ABITIBI PWR. & PAPER, com.			
—no par	91	....	....
Adirondack Pwr. & Lt.—7% pf.	103½	....	....
Adirondack Pwr. & Lt.—8% pf.	112	....	....
Ala. Pwr., pf.	106½	....	....
Allis-Chalmers Mfg. pf.	k109	105	110½
Allis-Chalmers Mfg., com.	85	78½	94½
Aluminum Co. of Amer., com.	70	....	....
Aluminum Co. of Amer. pf.	101	....	....
Amer & Foreign Pwr., pf 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	85	79	98
Amer. & Foreign Pwr., com.—no par	15	14½	42½
Amer. Bosch Magneto, com—no par	17½	16	34½
Amer. Brown, Boveri, Elec.	38½	30½	50
Amer. Brown, Boveri, Elec., pf.	95½	86½	97½
Amer. Elec. pwr., pf.	m111	102	111
Amer. Gas & Elec., 6% pf.—no par.	95½	....	....
Amer. Gas & Elec., com.—no par.	104½	64	110½
Amer. Lt. & Trac., 6% pf.	110	105	115½
Amer. Lt. & Trac., com.	210	193	263
Amer. Pwr. & Lt., 6% pf.	97½	....	....
Amer. Pwr. & Lt., com.—no par.	m 66½	50½	72
Amer. Pub. Serv., 7% pf.	a 97½	92	99
Amer. Pub. Serv., com.	50	45	80
Amer. Pub. Utilities, 6% pf.	78	....	....
Amer. Pub. Utilities, 7% pf.	92	....	....
Amer. Pub. Utilities, com.	68	....	....
Amer. States Sec., A	2½	....	....
Amer. States Sec. B	2½	....	....
Amer. Superpwr., pf.—25	25½	23	26½
Amer. Superpower, pf.	k 95	....	....
Amer. Superpwr., Class A—no par.	28½	19½	37½
Amer. Superpwr., Class B—no par.	l 95	21½	39
Amer. Wtr. Wks. & Elec., 7% pf.	k104½	101½	108½
Amer. Wtr. Wks. & Elec., com.—20.	51	43½	74
Anaconda Copper	47½	41½	51½
Appalachian Elec. Pwr., 7% pf.	98	99	101
Appalachian Elec. Pwr., 2d pf., 7%	98	99	102
Appalachian Elec. Pwr., com.	78	78	83
Arizona Pwr., 7% pf.	61	....	....
Arkansas Cent. Pwr., pf., $7—no par	k104	99	107
Arkansas Lt. & Pwr., 7% pf.	102	....	....
Arkansas Lt. & Pwr., com.	100	110	115
Asheville Pwr. & Lt., 7% pf.	l107	100½	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—86—no par	83	....	....
Assoc. Gas & Elec., Class A—no par	35	25½	38½
BABCOCK & WILCOX, com.	113	....	....
Binghamton Lt., Ht. & Pwr., pf.	90	92	95
Birmingham Elec. pf.—$7—no par.	105	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50.	102	100½	106
Blaw-Knox, com.	t 71	45	80
Bra lian Trac., Lt. & Pwr., com.	f108½	....	....
Broad River Pwr., pf.	94	....	....
Brooklyn Edison, com.	k154	133	163
Buffalo, Niagara&East. Pwr.,pf.—25.	l 24½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par.	l 30	....	....
CALIFORNIA ELEC. GENERATING, pf.	93	89	95
California Ry. & Pwr., pf.	195	88	130
Carolina Pwr. & Lt., pf.—$7—no par	107	....	....
Cent. & S. W. Ut. 7% pf.—no par	a 93	89½	96½
Cent. & S. W. Ut., pr. In. pf.—no par	a 99	93	100
Central Ariz. Lt. & Pwr., pf.	104	....	....
Central Ark. Ry. & Lt., 7% pf.	100	....	....
Central Ill. Pub. Serv., 6% pf.	a 88½	87	91
Central Ind. Pwr., 7% pf.	87	85	93½
Central Pwr. & Lt., pf.	100	....	....
Central States Elec., 7% pf.	91	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	b117	110	117
Chicago Fuse Mfg., com., no par.	a 32	30	35
Cincinnati Gas & Elec., com.	g 90½	88	95
Cities Service, 6% pf.	l 90½	86½	90½
Cities Service, pf.B—10.	i 8	7½	8
Cities Service, pf. BB—100.	l 81	74	81
Cities Service, com.—20.	l 47½	37½	47½
Cities Service, Bks. Shrs.—10.	l 23½	19½	23½
Clarion River Pwr., pf.	95	93	95
Cleveland Elec. Illg., 6% pf.	107½	....	....
Cleveland Elec. Illg., com.	296	....	....
Colorado Pwr., 7% pf.	k 95	96	97
Columbia Gas & Elec., 7% pf.	114½	111½	115½
Columbia Gas & E., com.—no par.	86½	63½	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104½	....	....
Columbus Elec. & Pwr., com.	240	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	98½	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93½	....	....
Col. Ry., Pwr. & Lt., com.—no par.	69½	....	....
Commonwealth Edison, com.	a137	135½	145
Commonwealth Pwr., 6% pf.	k89½	82	89
Commonwealth Pwr., com—no par.	39½	28½	48½
Conn. Lt. & Pwr., 8% pf.	117	....	....
Conn. Lt. & Pwr. 7% pf.	108	....	....
Cons. Gas of N. Y., pf.—50.	58½	....	....
Cons. Gas of N.Y., com.—no par.	107	87	115½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	e106	102	107½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	e110½	108½	111½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e113½	109	113½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e127	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	e 52½	45	57½
Cons. Pwr. & Lt., 7% pf.	103	....	....
Consumers Pwr., 6% pf.	98	....	....
Consumers Pwr., 6.6% pf.	104	....	....
Continental Gas & Elec., 7% pfc. pf	100	....	....
Continental Gas & Elec., 7% pr. pf.	97½	....	....
Continental G.&E., com.—no par.	165	....	....
Crocker Wheeler, com.	21	....	....
Crocker Wheeler, pf.	80	....	....
DALLAS PWR. & LT., 7% pf.	107	....	....
Dayton Pwr. & Lt., 6% pf.	100	....	....
Detroit Edison, com.	138	123½	141½
Dubilier Condenser com.—no par.	4½	3½	11
Dubuque Elec., 6% pf.	k 94	93	98½
Duquesne Lt., 7% pf.	115½	111½	116½
EAST. N. Y. UTIL. pf.	100	100½	104½
Eastern New York Util., com.	65	70	75
Eastern States Power.	13	....	....
Eastern States Power, pf.	89	....	....
Eastern Tex. Elec., 7% pf.	105	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com.	d221	207	250
E. Paso Elec., com.—no par.	70	70	94
E. Paso Elec. pf.	103	....	....
Elec. Bond & Share, 6% pf.	l106½	103½	109½
E. Bd. & Share Sec., com.—no par.	l 65½	56½	86
El. Household Util.	a 13	11½	25
Elec. Investors, 6% pf.—no par.	91	....	....
Elec. Investors, com.—no par.	37½	30½	74½
Elec. Investors, 10% pd. receipts	25	12	56
Elec. Pwr. & Lt., ctfs, pf.	k 94½	89½	98½
Elec. Pwr. & Lt., ctfs., 40% pd.	k101½	99½	115
Elec. Pwr. & Lt., ctfs. full pd.	k101½	102½	110½
Elec. Pwr. & Lt., ctfs., com—no par.	15½	15½	34½
Elec. Refrig.	45	43½	78½
Elec. Ry. Securities, com.—no par.	k 5½	4½	10
Elec. Storage Battery, com.—no par.	84½	71½	94½
Elmira Wtr., Lt. & R. R., 7% pf.	98	98	101½
Emerson Elec., pf.	b101	100	104½
Empire Dist. Elec., 6% pf.	l 88	82	88
Empire Power, A	26	....	....
Engr. Pub. Serv., pf.—no par.	93½	93	96½
Engr. Pub. Serv., com.—no par.	19½	19½	24½
Eureka Vac. Cleaner, com.—no par.	k 51	43	56
FAIRBANKS MORSE, pf.	42½	40½	59½
Fairbanks Morse, com.—no par.	k 43	40½	59½
Federal Lt. & Trac., com.	k 39½	28	39½
Federal Light & Traction, pf.	k 90	86	91½
Federal Utilities, pf.	m 70	....	....
Federal Utilities, com.	m 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l107½	105	108½
GALVESTON-HOUSTON ELEC., 6% pf.	60	....	....
Galveston-Hstn. El., com.	21	....	....
Gen. Elec., com	82½	79	95½
Gen. Elec., special—10.	11½	11	11½
Gen. G.&E., (Del.) com. A no par.	40	34	59
Gen. G.&E., (Del.) com. B no par.	m 38½	38½	48½
Gen. G.&E., (Del.) A pf. $8 no par.	k111	105½	113
Gen. G.&E., (Del.) A pf. $7 no par.	k 98	95	99½
Gen. G.&E., (Del.) pf. B.	k 94½	92½	96
General Public Service, pf.	m103	100	106
General Public Service, com.	m 12	12	16½
Ga. Lt., Pwr., & Rys., 6% pf.	90	82	98
Ga. Lt., Pwr. & Rys., com.	m 70	65	80
Ga. Ry. & Power, 8% pf.	k114	112	114
Ga. Ry. & Power, 7% pf.	106½	....	....
Ga. Ry. & Pwr., 4% pf.	m120	105	145
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h102	....	....
IDAHO PWR., 7% pf.	103	....	....
Ill. No. Utilities, 6% pf.	a 91½	90	92½
Ill. Pwr. & Lt., 7% pf.	98	....	....
Ingersoll Rand	92	80½	105
Int. Comb. Engr., com.—no par	39½	33½	64½
Int. Utilities, class A—no par.	k 30	25	39
Int. Utilities, class B—no par.	k 4½	3½	9½
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	97	96½	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	96	....	....
Jersey Central Pwr. & Lt., pfc., pf.	108	95½	112
Jersey Central Pwr. & Lt., com.—no par.	k 45	45	50
Johns-Manville, com.—no par.	140	130	165

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid, low, high. Saturday, Oct. 23. *l*Bid, low, high, Wednesday, Oct. 27. *m*Latest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Oct. 26	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	k112	107¼	112¼
Kansas Gas & Elec., 7% pf. ex. div.	l103¼	99	103½
Kentucky Hydro-Elec., pf.	a 93½	91¼	95½
Kentucky Sec.,6% pf.	80	....	....
Kentucky Sec., com.	100½	....	....
Kentucky Utilities, 6% pf.	93	90	95
Keystone Pwr. & Lt. 7% pf.	96	95	97
LACLEDE GAS LT., com.	162	146	175½
Lehigh Pwr. Sec., com.—no par	14½	10	22
Long Island Ltg., 7% pf.	108½	....	....
Long Island Ltg., com.—no par	130	120	150
Los Angeles Gas & Elec., 6% pf.	99	....	....
Louisville Gas & Elec., Class. A	24	22¼	26½
MANHATTAN ELEC. SUPPLY.	53	44	87½
Manila Elec., com.—no par	k 38	27½	45½
Maytag Mfg., com.	23½	19	24½
Memphis Pwr. & Lt. pf., $7, no par	108	103	110
Metro. Edison, pf.—$6—no par	93	....	....
Metropolitan Edison, pf., $7, no par.	104½	....	....
Metropolitan Edison, com., no par.	50	45	52
Middle West Utilities, 7% pf.	a105	97½	111½
Middle West Utilities, 7% pr. lien pf.	a115	106½	123½
Middle West Utilities, com.—no par.	a111½	103	134½
Midland Utilities, pr. ln. pf.	a100	98	104
Midland Utilities pf. A	a 97	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	98	100	102
Milwaukee Elec. Ry. & Lt., 6% pf.	91	87	88½
Minn. Pwr. & Lt., 7% pf.	l104½	100	104½
Miss. Pwr. & Lt., pf.	106½	....	....
Miss. River Pwr., 6% pf.	93	....	....
Miss. River Pwr., com.	60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par.	103½	99	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par.	98½	....	....
Mohawk Hudson Pwr., com.—no par	22½	20½	28½
Montana Pwr., pf.	m117½	112½	119½
Montana Pwr., com.	79½	69½	83½
Montreal Pwr., com.	f 74½	....	....
Mountain States Pwr. pf.	96	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	99	....	....
National Carbon, pf.	m125½	125	128
National Electric Pwr-A.	a 22	19½	26½
National Elec. Pwr., pf.	a93½	92	96½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	101½	96	102½
National Pwr. & Lt., com.—no par.	19½	16½	38½
National Pub. Serv., 7% pf.	89	....	....
National Pub. Serv., pte. pf.	110	....	....
National Pub. Serv., A com.—no par.	k 18½	15½	24
National Pub. Serv., B com.—no par.	k 13½	10	16½
Nebraska Pwr., 7% pf.	l107½	103	107½
Nevada-Calif., Elec., com.	k 20½	18½	44½
New Brunswick Pwr., pf.	55	30	55
New England Pub. Serv., pr. ln. pf.	99½	98	99½
New England Pub. Serv., pf.	93	95½	97
N. J. Pwr. & Lt., 7% pf.	109½	104	110
New Orleans Pub. Serv., 7% pf.	103	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	89	....	....
N. Y. Central Elec., 7% pf.	98½	98	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25	28½	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf.	109	110	111½
No. Amer., 6% pf.—50	k 50½	49	52½
No. Amer., com.—10	48½	42	67
No. Amer. Edison pf.—no par	96	91½	96½
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd.	m 94½	89	96
No. American Utilities, pf., 25% pd.	m 19	18	27
N.C Pub. Serv., pf.—$7—no par.	93	....	....
Northeastern Pwr., com.	16½	15½	36½
No. Indiana Gas & Elec., pf. A.	100½	98	103½
No. Indiana Public Service—pf.	100½	....	....
No. N. Y. Utilities, 7% pf.	103	....	....
No. Ohio Pwr., com.—no par	12	11	26½
No. Ohio Trac. & Lt., 6% pf.	78	78	81
No. Ohio Trac. & Lt., 7% pf.	92	88	96
No. Ont. Lt. & Pwr., pf.	83	....	....
No. Ont. Lt. & Pwr., com.	73	45	75
No. States Pwr., 7% pf.	102½	99½	103½
No. States Pwr. com.	103	97	136½
No. Texas Elec., 6% pf.	62	....	....
No Texas Elec., com.	19	....	....
OHIO BRASS, com. B—no par	68	70	79
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	94	92	95
Ohio Pwr., 6% pf.	95½	93	96
Ohio Pub. Serv., 6% pf.	j 94½	90	96½
Ohio Pub. Serv., 7% pf.	j 99	96	102½
Ohio River Edison, pf.	100½	....	....
Oklahoma Gas & Elec., pf.	96	....	....
PACIFIC GAS & ELEC., 6% pf.	98½	....	....
Pacific Gas & Elec. com.	129	118	133½
Pacific Pwr. & Lt., 7% pf.	l102½	98	102½
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt & Pwr., pf.—no par	c 72	70½	91
Penn-Ohio Edison, 7% pf.	96	....	....
Penn-Ohio Elec., 7% pf.	95	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	98	....	....
Penn-Ohio Pwr., & Lt., 8% pf.	107	....	....
Penn Pwr. & Lt.—$7—no par.	l106½	103	108½
Penn Pub. Serv., 7% pf.	103	96	103
Penn Pub. Serv., 6% pf.	87	85	90
Penna Wtr. & Pwr., com.	c162	141	171
Phila. Co., 6% pf.—50	c 49½	48½	50½
Phila. Co., com.—50	k 70	59½	76½
Phila. Elec., com.—25	c 47½	41½	67½
Pittsburgh Utilities, pf.—10	m 19½	14½	20½
Portland Elec. Pwr., 7% pf.	97	....	....
Portland Elec. Pwr., 6% pf.	83	....	....
Portland Elec. Pwr., 6% 2nd pf.	71	....	....
Portland Elec. Pwr., com.	27	....	....
Potomac Elec. Pwr., pf.	j107½	....	....
Pwr. Corp. of N.Y., com—no par.	m 79	77½	90½
Pwr. Sec., pf.—no par.	k 24	10	29
Pwr. Sec., com.—no par	k 6	4	13
Pub. Serv. of Colorado 7% pf.	j 99	96	100
Pub. Serv. of N. J., 7% pf.	109	103½	109½
Pub. Serv. of N. J., 8% pf.	k123½	115	124½
Pub. Serv. of N. J., com.—no par.	92½	72	97½
Pub. Serv of N. J., new com.	31½	20½	32½
Pub. Serv. of No. Ill., 6% pf.	a100	99½	106
Public Serv. of No. Ill., 7% pf.	a112½	112	116½
Pub. Serv. of No. Ill., com.—no par	a129½	128	140
Pub. Serv. of No. Ill., com.	a103½	128	143
Pub. Serv. of Okla., 7% pf.	98	92	j 97
Pub. Serv. Elec. & Gas, 6% pf.	102½	97	104½
Public Service Elec. Pwr., pf.	k112	106	114
Puget Sound Pwr. & Lt., 7% pf.	102½	....	....
Puget Sound Pwr. & Lt., 6% pf.	83½	....	....
Puget Sound Pwr. & Lt., com.	26	....	....
RADIO CORP. OF AM., pf.—50	49	44½	49½
Radio Corp. of Amer., com.—no par.	58	32	60½
Republic Ry. & Lt., pf.	109	....	....
Republic Ry. & Lt., com.	k 88	75	97
Rochester Gas & Elec., 5% pf.	m 95	80	98
Rochester Gas & Elec., 6% pf.	k102	100	103
Rochester Gas & Elec., 7% pf.	105	....	....
SAN JOAQUIN LT. & PWR., 7% pf.	97	97½	98½
Safety Cable, com.	k 51	42½	55
St. Joseph Ry., Lt., Ht. & Pwr., pf.	67	60	70
Servel Corp.	13½	12½	22½
Sierra Pacific Elec., com.	23½	23	28½
Sioux City Gas & Elec., 7% pf.	j 99½	....	....
S. E. Pwr. & Lt., pf.—$7—no par.	99½	....	....
Southeastern Pwr. & Lt., pfc. pf.	f 67	....	....
S. E. Pwr. & Lt., com.—no par.	28½	20	46½
So. Calif. Edison, 8% pf.—25	30	32½	33½
So. Calif. Edison, 7% pf.—25	27	....	....
So. Calif. Edison, 6% pf.—25	24	....	....
So. Calif. Edison, com.	30½	30½	33
Southern Cities Utilities, 7% pf.	85	....	....
Southern Cities Utilities, com.	34½	28	49
Southwestern Lt. & Pwr., A.	60	....	....
Southwestern Lt. & Pwr., B	60	....	....
Southwestern Lt. & Pwr., $6 pf.	80	....	....
Southwestern Pwr. & Lt., 7% pf.	103½	96½	104½
Springfield (Mo.) Ry & Lt., 7% pf.	97	96	100
Standard Gas & Elec., 8% pf.	56	53½	57½
Standard Gas & Elec., 7% pf.	101	....	....
Standard Gas & Elec., com.—no par.	53½	51	69
Standard Pwr. & Lt., 7% pf.	95	....	....
Staten Island Edison, pf.-$6-no par	96	....	....
Superheater, com.—no par.	150	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com	340	260	355
TAMPA ELEC., com.	48	....	....
Tenn. Elec. Pwr., 6% pf.	90	....	....
Tenn. Elec. Pwr. 7% pf.	102	....	....
Terre Haute, Ind. & East Trac., pf.	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	l106½	102	107½
Tide Water Pwr., 8% pf.	104	....	....
Timken Roller Bearing, com—no par	83½	44½	85
Toledo Edison, 8% pf.	l113	111	113
Toledo Edison, 7% pf.	l103	101	103
Toledo Edison, 6% pf.	j 94½	90	94½
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88	87½	89
UNITED GAS & ELEC., 6% pf.	97½	....	....
United Gas & Elec., com.—no par.	m 57	56	66
United Gas & Elec. (N.J.), 5% pf.	70	....	....
United Gas Impr.—50	c102	84½	144½
United Lt. & Pwr. pf.—$4—no par.	50½	44	51
United L. & P. pf.—$6.50—no par.	87½	81	91
United Lt. & Pwr., com., A—no par	a 11½	11	26
United Lt. & Pwr., com., B—no par	k 17	13	29
Utah Pwr. & Lt., 7% pf.	l103½	99	103½
Utica Gas & Elec., 7% pf.	105	....	....
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A	30	28½	37
Utilities Pwr. & Lt., com. B—no par	14½	13½	18½
VERMONT HYDRO - ELEC., 7% pf.	95½	94	96
Virginia Elec. & Pwr., 7% pf.	104	104	105½
Virginia Pwr., 7% pf.	108	102	104
Virginian Pwr., com.	70	65	75
WAGNER ELEC., pf.	b 73	61½	85
Wagner Elec., com.—no par.	b 23	13½	34½
Washington Ry. & Elec., com.	f172	....	....
Washington Ry. & Elec., pf.	j 90	....	....
Washington Wtr. Pwr., com.	132	130	136
West Mo. Pwr., 7% pf.	92	....	....
West Penn., 7% pf.	m115	108	115
West Penn, com.	m125	118	130
West Penn Elec., pf.	100	95½	101
West Penn Elec., Class A	k 92	88½	98
West Penn Pwr., 6% pf.	99½	95	101
West Va. Lt., Ht. & Pwr., 7% pf.	94½	95	98
West Va. Util ities, 7% pf.—50	47½	43	48
Western Pwr., 7% pf.	98½	91½	99
Western States Gas & Elec., 7% pf.	92½	....	....
Western States Cas & Elec., com.	18	....	....
Westinghouse El. & Mfg., com—50	67½	65	79½
Weston Elec. Instrument, Class A	32½	27½	32½
Weston Elec. Instrument, com.	16	13½	19½
Wheeling Elec., pf.	94	92	96
Wis. Pwr., Lt. & Ht., 7% pf	k 90	85	90
Worthington Pump, pf. A	k 55	63	80
Worthington Pump, pf. B	k 48	50½	65
Worthington Pump, com	26	20½	44½
YADKIN RIVER PWR., 7% pf.	l107	102	107½
Yale & Towne, com.—25	k 68½	60½	72½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Saturday, Oct. 23. lBid, low, high, Wednesday, Oct. 27. mLatest quotations available.

secured gold notes was made by the Colonial Gas & Electric Company, a piece of financing involving $2,000,000. The company, through its subsidiary or controlled companies, supplies electric light and power to Derby, Shelton and Ansonia, Conn., Newport, Jamestown, Middletown and Portsmouth, R. I., and gas to Derby, Shelton, Ansonia and Wallingford, Conn., in addition to operating a fleet of motor coaches between Newport, Fall River and Providence. These notes, dated Aug. 1, 1926, and maturing Aug. 1, 1929, were priced at 98½ and accrued interest, to yield about 6.05 per cent.

The Queens Borough Gas & Electric Company, New York, issued refunding mortgage gold bonds, 5 per cent series of 1955, to the amount of $1,500,000, the price being 99½ and accrued interest to yield 5.03 per cent. The proceeds from the sale of these bonds will be used to reimburse the company for additions, extensions and improvements to the properties of the company.

First mortgage thirty-year 6 per cent gold bonds of the Texas Power Corporation, totaling $1,600,000, were offered at 99 and interest yielding about 6.07 per cent, and collateral trust sinking fund 5 per cent gold bonds of the Electrical Securities Corporation, totaling $1,000,000, were offered at 98½ and accrued interest, to yield about 5.10 per cent. The Electrical Securities Corporation owns securities of various public utility companies.

Columbus Electric & Power Amends Charter.—An amendment to the charter of the Columbus Electric & Power Company has just been authorized by the Secretary of State permitting that company to increase its capital stock from $9,750,000 to $11,750,000. The increased capital is to consist of 20,000 shares of preferred stock at a par value of $100 a share. Permission was also granted the company to change 52,500 shares of common stock now issued to 52,500 shares at a par value of $100 and to exchange each of these shares for five shares of common stock without par value.

Republic Railway & Light Reduces Capital.—Stockholders of the Republic Railway & Light Company voted Sept. 23 to decrease the authorized common stock from $7,500,000 (par $100) to $3,750,000 (par $50).

Staten Island Utility Increases Shares.—The Staten Island Edison Corporation, Staten Island, New York, through James T. Taaffe, attorney, Al-

bany, has filed a certificate in the office of the Secretary of State increasing the number of shares of its non-par-value common stock from 200,000 to 280,000.

Pacific Gas Stockholders Vote Change in Set-up.—Stockholders of the Pacific Gas & Electric Company, meeting Oct. 11, voted approval of the new capital set-up outlined in the July 24 issue of the ELECTRICAL WORLD. In accordance with the proposal they (a) reduced the par value of the preferred and common stock from $100 per share to $25 per share, four new shares to be issued in exchange for each outstanding share; (b) voted to eliminate from the present authorized capitalization $100,000 par value of original preferred stock and to increase correspondingly the authorized amount of first preferred stock, and (c) authorized the directors to issue and sell to employees not to exceed $2,500,000 of first preferred 6 per cent stock and $2,500,000 of common stock.

Central Hudson Valley Companies to Merge

Directors and officers of the Central Hudson Gas & Electric Company and the United Hudson Electric Corporation with headquarters at Poughkeepsie have formulated a plan for the consolidation of these two companies and allied organizations, including the Dutchess Light, Heat & Power Company, the Philipstown Electric Corporation, the Kingston Gas & Electric Company, the Ulster Electric Light, Heat & Power Company and the Upper Hudson Electric & Railroad Company. All these companies have been for years under the same management. Their properties are contiguous, and together they form one economic unit which serves the entire central Hudson valley.

To carry out the plan it is proposed that all of the companies indicated shall be consolidated under the laws of the State of New York with an authorized capital of $10,000,000 of preferred stock, divided into shares of the par value of $100 each, entitled to cumulative dividends at the rate of 6 per cent per annum, and with limited voting power; and 700,000 shares of common stock without par value and with full voting power. The preferred stock is to be preferred both as to dividends and assets over the common stock.

On the assumption that all of the holders of the outstanding stocks including stock to be issued under sales heretofore authorized, or to be issued under bond conversions, will join in the consolidation, the stocks of the consolidated company will be distributed as follows, the balance of the authorized amounts being reserved for future needs: Preferred stock: Issued in exchange for preferred stock of Central Hudson Gas & Electric Company, $3,000,000; issued in exchange for preferred stock of United Hudson Electric Corporation, approximately $3,000,000; total, $6,000,000. Common stock: Issued in exchange for common stock of Central Hudson Gas & Electric Company, 187,548 shares; issued in exchange for common stock of United Hudson Electric Corporation, 112,500 shares; total, 300,048 shares.

United Light & Power Adds Property

Gross Income Available for Parent Company Amounted to $10,387,692 Against $4,339,416 for the Previous Year

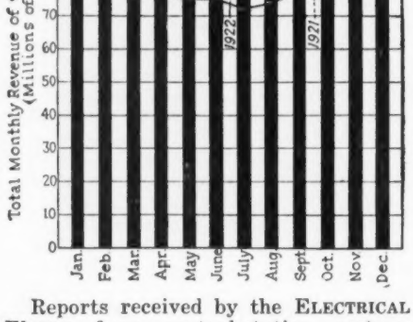
A BARE statement that gross earnings of the United Light & Power have tripled from $11,896,914 in 1924 to $36,742,023 in 1925 would be true but might be misleading. A number of valuable properties were acquired during the year, and gross earnings of all companies now controlled were $33,573,145 in 1924. The gross revenue for last year was nearly one-fifth of the total capital, which is close to the average for companies of this type.

During the year the company acquired control of the Brooklyn Borough Gas Company and the Ohio Utilities Company, and the consolidation of the latter company with the Southern Ohio Electric was effected, operations now being conducted under the name of the United Ohio Electric Company. The Blue River Power Company was also acquired and consolidated with properties of the Nebraska Gas & Electric Company, unifying a superpower system in southeastern Nebraska serving more than a hundred cities and towns in that section. Furthermore, a number of new plants were put into operation during the year.

Out of the gross of $36,742,023, operating expenses and maintenance totaled $18,813,225 and taxes required $2,915,667, or nearly 8 per cent of gross earnings. Earnings of subsidiary companies amounted to $15,012,139, leaving net earnings from all sources of $17,275,735. Interest of $4,337,772 was earned approximately four times. Deductions, including interest on funded debt and prior preferred dividends, took something over $3,000,000, leaving net income of $7,114,586. Class A no-par preferred stock dividends amounted to $887,660 and class B dividends to $324,000. After the deduction of these the surplus available for depreciation, amortization and common stock dividends amounted to $5,902,925, against $1,463,439 from the smaller number of companies during the previous year.

The capital structure of the company is somewhat involved. The total capital stock outstanding is $77,620,820 and the total funded debt in the hands of the public amounts to $130,952,450, making total capital liabilities of $208,573,270. Of this obligations account for approximately 63 per cent, which is higher than the average. The average yearly net earnings during the twelve-year period that ended in 1925 amounted to $4,607,352.

Gross Revenue Totaled $129,200,000 in August



Reports received by the ELECTRICAL WORLD from central-station systems representing 76 per cent of the total generator rating of the industry indicate that the total gross revenue from the sale of energy during the month of August was $129,200,000, an increase of $14,200,000, or 12.3 per cent, over August of last year. The operating and maintenance expenses totaled $61,100,000.

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of September:

Name of Company	Gross Earnings for September 1926	1925
Alabama Power	$1,104,978	$1,164,540
American Power & Light*	4,686,935	4,050,180
Bangor Hydro-Electric	153,131	137,836
Brazilian Trac., Lt. & Pwr.	3,412,431	2,846,091
Central Illinois Light	326,573	327,701
Central Maine Power	430,318	397,912
Cities Service	1,875,103	1,231,068
Commonwealth Power	4,050,485	3,566,096
Consumers Power	2,023,654	1,697,044
Electric Power & Light	4,144,754	3,919,355
Florida Power & Light	943,498	807,876
Illinois Power	185,790	191,334
Kansas City Power & Light	831,696	786,805
Massachusetts Ltg. Cos.	345,130	319,388
Northern Ohio Power	1,001,809	921,787
Ohio Edison	139,068	113,584
Portland Electric Power	965,215	876,338
Republic Railway & Light	1,025,606	873,515
Southern California Edison	2,516,585	2,250,446
So. Indiana Gas & Elec.	226,034	210,010
Tennessee Electric Power	992,435	934,570
Washington Water Power	457,694	513,964

* August

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
American Superpower, com. A and B	0.30	Dec. 31
American Superp'wr, com. A and B*	.50	Dec. 31
American Superpower, 1st pf.	$1.50	Jan. 3
Associated Gas & Elec., $6 pf.	$1.50	Dec. 1
Associated Gas & Elec., $6½ pf.	$1.62½	Dec. 1
Bangor-Hydro Electric, com.	1¼	Nov. 1
Brazilian Trac., Lt. & Pwr., ordinary	1¼	Dec. 1
Cambridge Electric Light	$1	Nov. 1
Cedar Rapids Mfg. & Power	¾	Nov. 15
Central & Southwest Utilities, pr. In. and pf.	$1.75	Nov. 16
Connecticut Ry. & Ltg., com. and pf.	$1.12½	Nov. 15
Eastern States Power, pf.	$1.75	Nov. 1
Edison Elec. Illum. of Brockton	.62½	Nov. 1
Electric Household Utilities	.50	Oct. 30
Electric Refrigeration, com.	.50	Nov. 20
Electric Refrigeration, com.†	1¼	Nov. 20
Georgia Railway & Electric, pf.	1¼	Oct. 20
Kentucky Utilities, junior pf.	1¼	Nov. 20
Montreal Lt., Ht. & Pwr., Consol.	.50	Nov. 15
Montreal Lt., Ht. & Pwr.	2	Nov. 15
National Power & Light, com.	.20	Dec. 1
Northern New York Utilities, pf.	$1.75	Nov. 1

* Payable in participating preferred.
† Payable in common.

Manufacturing and Markets

Power Factor of Appliance Motors

The Committee Recommends Guarding Against Motors of Low Power Factor or High Starting Current

RAPIDLY growing use of motor-operated household appliances augmented by the use of electric refrigerators and oil burners till the household motor load has become an appreciable factor has caused various central-station companies to consider the effects of such a load on the system power factor. A paper presented last month before the electrical section convention of the Wisconsin Utilities Association by E. S. Schrank, chairman of the power-factor committee, discusses the serious effects of fractional-horsepower motor loads on the system power factor.

To study the ill effects of small motors in residential districts, an investigation was conducted in several of the cities in Wisconsin. In one case the local utility found three cases of severe voltage fluctuations caused by small motors operating intermittently on the lighting circuit. In another Wisconsin city a test was made on five fractional-horsepower motors, two of which were ¼-hp., 110-volt motors connected to washing machines, one a ⅛-hp., 110-volt motor connected to a washing machine, one a ¾-hp., 110-volt motor connected to an electric refrigerator, and one a ½-hp., 110-volt motor connected to a shoe-sewing machine. The results of this test are given in Table I, and emphasize the extremely high current inrush in certain of these motors, and in general, the low power factor when operating.

In still another Wisconsin city a careful study was made of the power factor and the efficiency of a number of small motors under various load conditions. The results of this study are shown in Table II. This latter test was made with particular care and in a well-equipped laboratory. It is noted that the half-load power factor varies from 68.1 per cent down to 32.4 per cent and the full-load power factor from 72.8 per cent down to 45.1 per cent, while the corresponding efficiencies vary from 63.2 per cent down to 30 per cent and from 59.6 per cent down to 36.9 per cent. The apparent efficiencies vary from 42.6 down to 23 per cent, with an average of only 31.6 per cent.

These results conform closely with those found in a similar experiment carried out by Prof. Benjamin F. Bailey of Michigan University for the Detroit Edison Company. In reporting on his experiment Professor Bailey brought out the point that so long as a motor will start and operate a load the user is not particularly interested in its other characteristics, and that too often in the design of these small motors high starting torque is obtained at the sacrifice of power factor and efficiency. For vacuum cleaners, washing machines and similar motorized household equipment, which operate very seldom, such motors are satisfactory and certainly are cheaper in first cost than those having a higher apparent efficiency.

The report points out that Tables I

TABLE I—POWER-FACTOR TESTS ON SMALL SINGLE-PHASE INDUCTION MOTORS

Name Plate	Use	Condition	Volts	Amp.	Watts	P.F.(Calc.)
Motor No. 1: 110 volts, 4.8 amp., 60-cycle, single-phase, ¼-hp., 545 frame.	Washing Machine	Run light	120	5.50	230	34.8
		Belt off	121	5.58	168	24.9
		Run with no washing load	119.5	5.45	260	39.9
		Loaded	119	5.6	330	49.5
Motor No. 2: 110 volts, 4.8 amp., 60-cycle, single-phase, ¼-hp., 545 frame.	Washing machine	Run light	118	4.95	190	32.6
		Run loaded	117	5.05	300	50.8
Motor No. 3: 110 volts, frame 145, 4.2 amp., induction-wound, ¼-hp., 1,725 r.p.m. 60-cycle, single-phase.	Washing machine	Run light	118	4.35	200	38.9
		Run loaded	117	4.60	300	55.7
Motor No. 4: 110 volts, 3.9 amp., single-phase, ¼-hp., 1,725 r.p.m., 60-cycle.	Refrigerator	Belt off	119	3.58	70	16.4
		Normal light	119	3.8	175	38.7
		Loaded	116	4.7	370	67.8
Motor No. 5: ½-hp., 3.5-7 amp., 110/220 volts, type 100 M, 1,725 r.p.m.	Shoe-sewing machine	Run light	120	5.1	233	38.1
		Loaded	118	5.4	320	50.2

TABLE II—POWER-FACTOR AND EFFICIENCY TESTS

Motor	Hp.	P. F. Starting	P. F. No Load	P. F. Half Load	P. F. Full Load	Per Cent Efficiency		Per Cent Apparent Efficiency
						Half Load	Full Load	
Company A: 1	⅛	66.6	53.4	68.1	72.7	30.5	36.9	26.8
2	⅛	59.2	28.2	44.8	62.6	40.4	54.9	34.4
3	¼	51.8	24.3	46.4	61.6	45.0	58.7	35.9
4	¼	53.4	25.3	40.0	57.5	47.5	58.5	33.7
5	¼	55.3	37.8	56.2	72.8	39.5	58.4	42.6
6	¼	54.5	25.1	41.6	58.8	42.3	54.7	32.2
Average..		53.5	28.1	46.0	62.55	43.57	58.1	36.3
Company B: 1	¼	54.5	29.4	46.2	60.5	35.7	49.4	29.9
2	¼	50.9	24.7	43.2	59.9	30.0	55.4	33.3
3	¼	52.7	25.1	40.0	56.5	42.5	55.9	31.6
Average..		51.8	24.9	41.6	58.2	36.2	55.6	32.3
Company C: 1	¼	49.4	23.1	42.4	67.0	44.5	59.6	35.7
2	¼	48.6	23.9	48.0	48.4	35.2	50.2	24.3
3	¼	48.8	23.3	38.6	50.0	30.9	46.0	23.0
Average..		48.9	23.4	40.3	52.8	36.8	51.9	27.5
4	¼	46.3	20.9	38.0	3.05	44.4	58.3	30.9
5	¼	46.7	21.8	37.7	51.5	42.1	57.8	29.8
6	¼	46.3	22.2	39.4	52.7	41.1	57.3	30.2
7	¼	45.8	20.5	37.3	50.9	41.7	56.4	28.7
8	¼	42.5	27.3	44.4	58.8	42.1	54.9	32.3
Average..		46.72	22.54	39.36	53.38	42.32	56.94	30.4
9	⅛	42.6	23.7	39.3	49.4	40.3	58.6	29.0
Company D: 1	⅛	64.6	19.2	40.0	59.5	52.0	60.8	36.2
2	⅛	66.6	24.1	41.0	57.9	48.2	58.2	33.7
Average..		65.6	21.65	40.5	58.7	50.1	59.5	34.9
Company E: 1	⅛	50.0	25.7	40.54	72.4	44.2	47.2	34.2
Company F: 1	1/10	68.9	25.1	51.1	63.2	42.6	55.7	35.2
2	⅛	46.9	18.6	32.4	45.1	41.1	55.3	24.9
Company G: 1	¼	43.7	16.7	33.2	51.0	44.7	52.6	26.9
Company H: 1	⅛	48.2	24.1	35.8	50.5	41.4	55.0	27.8

and II indicate the difficulty which power companies will experience to an increasingly greater extent when electric refrigerators and automatic oil burners become more numerous. With a 110-volt, ½-hp. motor, which has a starting current of 29 amp. and an operating power factor of approximately 50 per cent, being used intermittently, satisfactory lighting service may be hard to realize. The recommendation that was made by the committee was to the effect that utility companies guard against the connection of motors of unduly low power factor or high starting current.

Collens Gets McGraw Award

Manufacturers' Medal and Purse Presented at Briarcliff Meeting of Power Apparatus Makers

THE James H. McGraw manufacturers' medal and purse for 1926 was awarded to Clarence L. Collens, president Reliance Electric & Engineering Company of Cleveland, at the fall meeting of the Apparatus Division of the National Electrical Manufacturers' Association, successor of the Electric Power Club, held at Briarcliff Lodge on Oct. 25. The judges appointed by the association to review the field and make the award to the man who in their opinion made the most outstanding contribution to the advancement of the electrical manufacturing industry within the past year were Gerard Swope, president General Electric Company; D. Hayes Murphy, president Wiremold Company, and J. M. Curtin, manager industrial department, Westinghouse Electric & Manufacturing Company.

The citation accompanying the award was as follows:

CLARENCE L. COLLENS, president Reliance Electric & Engineering Company, Cleveland, for years an outstanding advocate of harmony both in standards and

Increased Operations During September

SEPTEMBER witnessed a material increase in the operations of the nation's electrical manufacturing plants taken as a whole. This increased productive activity by this branch of general industry is in line with the operations reported by American industry in general during Sepember. The upward swing during September from the August operations was, however, greater for the electrical manufacturing plants than for industry in general.

Based upon the returns received by the ELECTRICAL WORLD, it is estimated that during September the electrical manufacturing plants of the nation consumed 72,500,000 kw.-hr. of electrical energy as against 65,600,000 kw.-hr. in August, a gain of 10.4 per cent. In spite of this gain in operations by the industry as a whole, some plants reported operations under those of August. Such is the picture of activity in the electrical manufacturing plants of the nation based upon reports received by the ELECTRICAL WORLD on the consumption of electrical energy by a large percentage of the manufacturing companies.

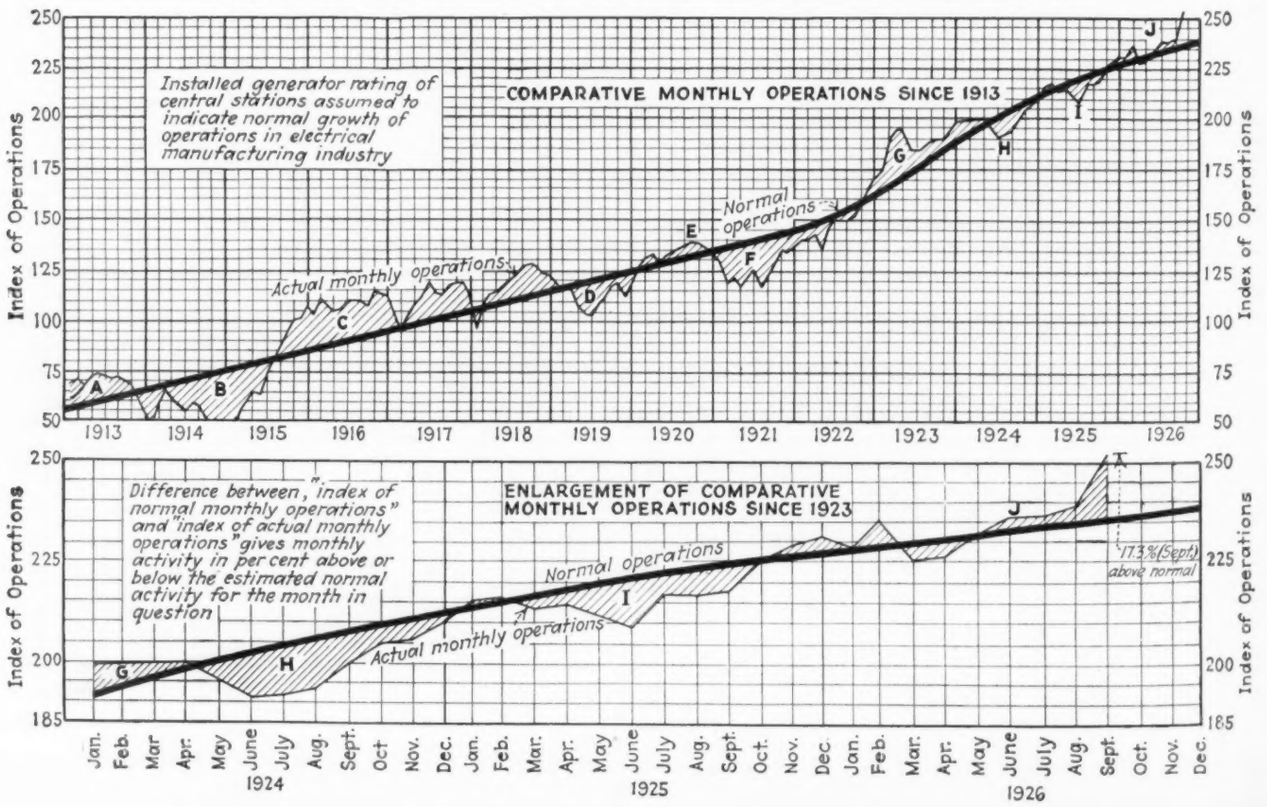
The reports for the month of September indicate that the industry was operating at 17.3 per cent above the estimated normal for that month as against 4.2 per cent above normal during August. Activity in the electrical manufacturing plants since the opening of the year has been slightly above normal with the exception of March and April, when the reports on energy consumption indicated a temporary slump in operations. The operations reported for September are materially above those reported for any previous month of this year. A comparison of the activities during September and August without correction for seasonal variation indicates that actual production activities during September were 10.4 per cent over those of August.

The large increase in activity in the electrical manufacturing plants of the nation during September is emphasized when comparison is made with operations in the other primary industries during the same month. American industry as a whole was operating during September at 2.9 per cent above August and 10 per cent above September of last year.

The rolling mills and iron and steel plants were operating at 5.8 per cent above August, the textile plants 7.2 per cent above August, while the automobile manufacturing plants reported operations 2.5 per cent under those of August. The electrical manufacturing plants, therefore, reported a higher rate of increase over August than other primary industries.

***Electrical World* Barometer of Activity in the Electrical Manufacturing Industry**

(Corrected for seasonal variation and referred to an average monthly normal for the year)



policies within the electrical manufacturing industry and a tireless worker for a closer co-ordination between the associated groups, by the influence of his enthusiasm, energy and sound judgment has carried this ideal and purpose steadily forward and become a recognized leader for co-operation among the electrical manufacturers. As president of the Electric Power Club he was instrumental in effecting a solution of the long-standing controversy over temperature ratings in electric motors and in reconciling this adopted standard with the viewpoint of the National Electric Light Association. More recently realizing the advantages to be gained by an actual union of the separate associations of electrical manufacturers, as chairman of the Electrical Manufacturers' Council he initiated a movement to effect the organization of a single industry association to embrace the membership of the Electrical Manufacturers' Council, the Electric Power Club and the Associated Manufacturers of Electrical Supplies, which he carried to successful consummation in the formation of the National Electrical Manufacturers' Association this fall. In recognition of this constructive contribution to the advancement of the manufacturing branch of the electrical industry the judges have awarded to Mr. Collens the manufacturers' medal and purse given under the James H. McGraw award for 1926.

The presentation was made by Earl E. Whitehorne in behalf of the sponsor committee of awards.

Ironing Machine Makers Organize Association

At a meeting of representatives of leading manufacturers of electric ironing machines held at New York City on Oct. 26 it was voted to form a national association of electric ironer manufacturers. H. G. Grosse, president of the American Ironing Machine Company, was elected president, and C. G. Frantz, president of the Apex Electrical Manufacturing Company, was elected secretary. An executive committee was appointed to formulate future association activities.

Present market opportunities for the ironing machine were discussed, and there were talks by O. H. Caldwell and L. E. Moffatt of *Electrical Merchandising*, C. E. Greenwood, chairman merchandising committee, N.E.L.A.; F. M. Feiker, vice-president Society for Electrical Development, and Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD.

Business Conditions

THE electrical market continues stable and in good volume. Despite some gloomy predictions for the future, the large majority of electrical manufacturers and utilities look forward to continued good business this fall and next year. Utility budgeting is at a peak, with general increases. Manufacturers are preparing production reports upon the basis of field reports, and in nearly all cases business estimates for next year exceed those of this year.

Normal volume in general buying has been witnessed this week. Somewhat of a slump in the South is offset by increased business in New England and on the Pacific Coast. Industrial activity in New England is evidenced by inquiries and sales, and, in particular, the textile industry reports a change for the better. Diversified lines of electrical switching and construction equipment continue in demand. The intensified drive for appliance sales this year continues to attract a good volume of business in nearly all sections. Good business for the season continues to be reported by those manufacturers having sales in all territories.

Some recession in building is noticed in the East, but in the Middle West and Southwest construction continues at a rapid rate. Inquiries are heavy from power companies in all sections in connection with budget plans.

A Dull Week in the Metal Market

Prices of the non-ferrous metals are a little lower this week and the volume of business in copper, lead and zinc has been small. Only two sellers have participated to any extent in the copper market, inquiries were next to nothing and business has been the result of solicitation supported by price reductions. There have been no sales under 14 cents. On Thursday and Friday of last week the price was 14.05 cents for Connecticut delivery and in the Middle West 14.17 cents. Copper Exporters, Inc., has maintained its foreign price at 14.40 cents c.i.f., and Germany, France, Italy and England have all been in the market, with Germany the leading buyer. There are indications that there is good business behind the domestic market, but consumers are jockeying for the lowest possible price. Producers, however, are not overstocked with metal.

NEW YORK METAL MARKET PRICES

	Oct. 20, 1926 Cents per Pound	Oct. 27, 1926 Cents per Pound
Copper electrolytic	14.15	14.00
Lead, Am. S. & R. price	8.35	8.25
Antimony	14¼	13¾
Nickel, ingot	35	35
Zinc spots	7.65	7.55–7.57½
Tin, Straits	69¼	69¾
Aluminum, 99 per cent	27	27

Base copper price Oct. 27, 1926, 16½ cents.

The American Smelting & Refining Company reduced its contract price for New York lead on Oct. 25 from 8.35 cents to 8.25 cents. No reduction was made in the St. Louis market. Sales have been considerably less than last week, though a moderate business is recorded, with shipments equally divided between prompt and November. Foreign demand continues satisfactory.

The week has been dull in the zinc market, with prices slightly lower than Monday. Both galvanizers and brass smelters have bought sparingly, mostly for November delivery. Stocks in the hands of consumers are scant.

Industrial Equipment Attracts Attention in New England

The industrial situation in New England is improving rapidly and is beginning to reflect an encouraging trend in the movement of electrical supplies and equipment in this district. One prominent manufacturer reports inquiries and negotiations from mill areas gradually mounting in volume and predicts that the remainder of the current year will witness more than a normal volume in orders. Motor sales are steady and in good volume; turbo-generator sales are coming along satisfactorily, and orders for two units each of 2,500 kw. capacity were received this week. Small switch and control apparatus and general mill supplies are in good demand, and during the past week equipment for two plants amounting to more than $50,000 was placed. One of the most encouraging aspects of the situation, in the opinion of one manufacturer, is the tendency away from hand-to-mouth buying, a practice which has predominated among textile mills for a number of years. Lately, according to one source, the establishment of larger budgets for supplies and upkeep is an encouraging feature in the electrical market, which promises increased activity this fall as compared with last year.

Industrial electric lighting is active. One central station records much activity in factory lighting. Another is concentrating on store lighting and is busy with many new projects, of which two include store-lighting surveys for fair-sized cities in eastern Massachusetts. Industrial heating is moving along with increasing activity. Household electric appliance sales are gaining, one group of central stations continuing to show increasing volumes of sales for each succeeding week this fall. The general business situation is very gratifying, with the contract volume for the past week for this district recorded at a peak level in excess of all previous years.

Cotton Situation Affects Southeastern Business

Electrical business in the Southeast was slower last week than for many weeks past, owing in a great measure to the drop in price of cotton and to the fact that the larger utility companies are engaged in preparing 1927 budgets and that therefore little activity other than routine business is to be noted. The cotton situation has tended to tighten the money market to some extent, and this is being reflected in business generally, though its volume is still reported satisfactory.

South Georgia continues to be a large purchaser of line-construction materials, one order received this week from that territory being for $7,000 worth of insulators and pole-line hardware. The aggregate of orders from the section generally for poles, pole-line hardware and wire is satisfactory, though no large individual orders have been received of late. Florida is also ordering in reasonable volume distribution transformers, street-lighting equipment, incandescent lamps and poles and wire for storm replacement work, and some housewiring material orders are also reported.

Jobbers report good orders for electrical construction materials from cotton mills in north Georgia, a number of industrial-motor orders ranging from $4,000 to $5,000 each being received from the territory generally. There is some power transformer and substation equipment business pending in the Caro-

linas, and orders on the same are expected to be placed within the next two or three weeks. An intensive power survey of all the Southeastern properties of one of the largest holding companies is under way and will undoubtedly result in considerably increased power loads on the various systems, with the attendant stimulation of power equipment lines.

The demand for heating appliances for holiday stocks is reported strong, with electrical toys already beginning to move. Range sales are holding up well, and several campaigns are under way over the territory, particularly in Florida. Campaigns on commercial and industrial lighting equipment during the next two months will stimulate considerably the sales of this equipment in the territory.

Middle West Market Shows Good Volume

Indications from all points of the Middle West are that business is continuing its recent rate of speed. No recession in building activity is evident. In the Chicago district it is about 20 per cent ahead of the same period last year. The volume of electrical business is very satisfactory, and general optimism is manifested throughout the entire section. The various utility companies are busy extending their lines, and while no notably large orders for apparatus were placed this week, maintenance purchases are in good volume, with the total volume of sales to the power industry assuming sizable proportions, one company's purchases averaging $105,000 per day. Among the interesting orders placed this week were seven carloads of copper busbar, 20,000 pin-type porcelain insulators and an order for truck-type disconnecting switches valued at $75,000. There has been a good demand for pole-line hardware, weatherproof wire and meters.

Jobbers generally report good business. Appliances are moving readily, with a good demand for toasters and heaters. Washing machines are moving well, one jobber placing a single order for 750 machines this week. There has been a healthy demand for code wire, prior to an advance in price, with a steady demand for conduit and wiring devices. Prices remain generally firm.

In the St. Louis district there is no change from last week. As to the year's business, one prominent jobber states that only one item among a large number of lines handled will fall below last year's business for the ten months elapsed. At the present time the large operating companies are sending out inquiries for the various items of construction and equipment required for their next year's budget. The quantities mentioned in their memoranda indicate quite extensive programs of expansion for 1927. One of the largest Portland-cement companies has just placed an order for motors and accessories aggregating around $10,000. One of the lead-mining companies in the district adjacent to St. Louis placed an order for a 4,000-kw. turbo-generator last week. This is the second unit of approximately this size sold to the lead mines in the past month.

Power-Company Activity Revives on Coast

Power-company inquiries have characterized the past week on the Pacific Coast. This is a class of business that has been dormant for several weeks. Activity in poles is particularly noticeable, and inquiries for one carload each of 20-ft., 30-ft., 40-ft. and 55-ft. poles, three carloads of 8-in.-top, 45-ft. poles and two carloads of 10-in.-top, 60-ft. are reported. Porcelain insulators are also in good demand, there being inquiries for one carload each of clevis and loop-and-hook types and also for miscellaneous 30-kw. types, aggregating $2,500. Miscellaneous power inquiries concern 30,000 assorted bolts complete with washers, three special time switches for a 3,300-volt circuit and 20,000 fuse plugs. Railroad orders include 5,000 guy clamps and 5,000 dry batteries. Export orders are featured by 1,000,000 ft. of No. 17 single-drop wire and 600,000 ft. of paired telephone wire, all for 1927 shipment to the Philippines. Dealers report an excellent business in radio accessories, especially chargers and batteries. Some recent broadcast innovations in symphony and operatic music have given a marked impetus to sales of receiving sets. Contractors' and industrial orders have included 2,000 toggle switches and 1,500 convenience outlets complete with bakelite plates, 1,000 heavy-duty heater switches, 1,000 stand-lamp clusters and 3,000 lb. of No. 6 bare copper wire, the last being for a lumber company. Prices are steadier, switch and conduit boxes having advanced 10 per cent and No. 14 single solid-rubber-covered wire 3 per cent, with further advances predicted. The outstanding power apparatus order covers one steam turbine rated at 3,000 kw. and 2,300 volts for a Hawaiian Island sugar plantation, complete with incidentals. This order totals $75,000. Other machinery orders include miscellaneous motors, a motor-generator set and a transformer worth $25,000 for a pulp and paper mill. Eighty sets of ½-hp. and ¾-hp. motor parts were bought by a manufacturer of oil-burner equipment.

Improved Buying for Central Stations in New York

Central-station buying in the New York district is improving, except that the demand for generating apparatus is still dull. Transformer sales, too, are slow, but an increase is apparent in the inquiries received for quotations on this apparatus. Switching equipments are in fair demand, a good volume of small individual orders and inquiries being reported by manufacturers. A brisk demand for pole-line hardware is reported, including some substantial sales to holding companies to replace damaged installations in Florida. Some sales are also reported to holding companies for short-line extensions in the Middle Atlantic and New England States. Poles and cross-arms are strong, although individual orders are limited to one or two carloads. Industrial buying of motors is steady, with a slight increase in the demand for motors of from 10 hp. to 50 hp. Control apparatus is stronger than last week, but is still quiet. Jobbers' lines are steady, and an increase in the movement of appliances is reported.

Activities of the Trade

Link-Belt Company Moves Boston Office

The Boston office of the Link-Belt Company, formerly at 49 Federal Street, will be moved on Nov. 1 to 1103-1104 Statler Building, in the center of the Back Bay district and close to the Back Bay station. The removal has been necessitated by a steadily increasing growth of business.

Frigidaire Corporation's Factory Extension Nearly Finished

The Frigidaire Corporation's twenty-million-dollar factory expansion project is nearing completion in Dayton, Ohio, a large number of the new buildings being under roof, and machinery is being installed. It will be placed in production early in 1927. When completed the company will have 53 acres of factory space devoted to manufacture of electric refrigeration units, with a capacity of 50,000 units a month.

For the second time within a period of three months the Frigidaire Corporation announces a price reduction in its ice-cream cabinet line. Frigidaire ice-cream cabinets were cut when a general price reduction affecting both the household and commercial Frigidaire lines was announced in August. The second price reduction, which is very substantial, was made Oct. 6, simultaneously with the opening of the dairy products and ice-cream manufacturers' show at Detroit. At this show the corporation exhibited for the first time an electrically refrigerated ice-cream delivery truck, the first step the Frigidaire Corporation has made in the field of electrically refrigerated transportation. The current used is supplied by a Delco-Light electric plant.

American Jobbers' Supply Builds New Cross-Arm Factory

A new cross-arm factory and general warehouse has just been constructed by the American Jobbers' Supply Company, 1502 Woolworth Building, New York, at Ninth and Chesapeake Avenues, Baltimore. The buildings are on a tract over two acres in extent, and the company has constructed its own railroad siding between the two warehouses. The making of cross-arms in the new plant has just been started. The company asserts that much of the business for finished cross-arms which was formerly placed with Pacific Coast mills will now be placed at the Baltimore factory. The lumber used will be shipped by boat from the Pacific Coast.

The Pittsburgh Reflector Company, Pittsburgh, has appointed Lyman D. Morgan manager of the Northern Pacific section, with offices at 240 Securities Building, Seattle. Mr. Morgan recently returned from Philadelphia, where he assisted in the design and installation of electrical lighting effects at the Sesquicentennial Exposition.

The Texlite Electric Sign Company, Dallas, Tex., will lease a factory building to be constructed on East Commerce Street, between Ashland and Parry Avenues, and will establish a new plant there. It will be one-story, 135 ft. x 150 ft., with extension 31 ft. x 35 ft., and is estimated to cost close to $60,000 with equipment.

The Roto Company, Hartford, Conn., manufacturer of electrically operated boiler-tube cleaners, etc., is perfecting plans for the early occupancy of a new plant at Newark Street and Sussex Avenue, Newark, N. J., recently leased. The building is two-story, 100 ft. x 100 ft., and will be remodeled and improved. The company will remove a portion of its equipment from its present plant at Hartford to the new location and install additional machinery.

The General Electric Company has just completed the building of a storage-battery locomotive weighing 110 tons and capable of hauling a 1,500-ton train equivalent to 70 empty or 30 loaded freight cars at a speed of from 8 to 10 miles an hour. This locomotive is now in service in Chicago.

The General Necessities Corporation, Detroit, owner of the Absopure Company, manufacturer of electrical refrigerators, has announced purchase of the capital stock, plant, etc., of the Vogt Refrigerator Company, 618 Barret Avenue, Louisville, and plans to enlarge the Louisville plant in order to insure large production of the Vogt refrigerator.

The Graybar Electric Company has shipped one of the largest lighting unit orders of its kind by express to the Florida Power & Light Company, at Miami, Fla., for reconstruction purposes. The order consists of 1,000 "Novalux" center-span fixtures, with cross-arm suspension and radial wave reflectors.

The Westinghouse Electric & Manufacturing Company has awarded a building contract for its four-story factory branch and distributing plant on Trumbull Street, near Stanley Street, Detroit.

The National Carbon Company, Inc., Cleveland, has prepared a motion picture, entitled "Behind the Pyramids," which shows in a very interesting manner the manufacture, application, operation and care of carbon brushes and other carbon products used in the electrical industry. This picture will be shown before technical society meetings, operating department groups, engineering college classes, etc.

The American Steel & Wire Company, 208 South La Salle Street, Chicago, announces that since Oct. 4 its Birmingham (Ala.) office has been greatly enlarged and made a center of sales operations for the district and has been made a unit of the general sales office in Chicago. J. J. Gilmore, formerly in charge of the office, has been promoted to be manager of sales. From this office, which is in the Brown-Marx Building, Alabama, Mississippi and Louisiana are covered.

The Fitzgerald Manufacturing Company, Torrington, Conn., announces that it has placed on the market a new standard 6-lb. electric flatiron known as the "Star-Rite."

The Cutter Company, Philadelphia, manufacturer of circuit breakers, has published a book entitled "Experience Is Master," in which it describes the company's organization and policy. Photographs of those men who have served the Cutter organization and its customers for ten years or more are included. Who these men are and the nature of their duties are explained.

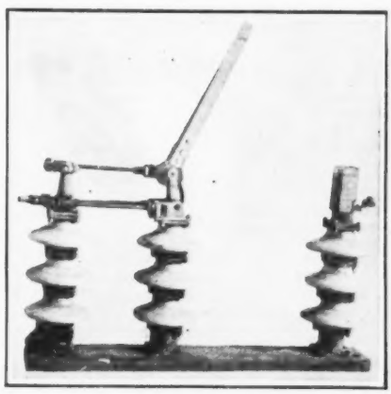
The Westinghouse Electric & Manufacturing Company announces that T. C. Randall has been appointed street lighting engineer in the Buffalo territory.

The Bridgeport Brass Company, Bridgeport, Conn., announces that J. R. Brandt has joined the Cleveland office, at 2017 Superior Viaduct, as raw-material salesman in the Pittsburgh territory and parts of Ohio.

New Equipment Available

Disconnecting Switch

A new line of gang-operated manually controlled or motor-controlled disconnecting switches has been developed by the Delta-Star Electric Company, Chicago. One element of the three-pole switch is shown in the illustration, the other poles being mechanically interlocked by means of standard iron pipe. Either petticoat or flange-type insulators can be used, and this construction permits the assembly of the switch for any voltage from 33 kv. to 110 kv. The blade is of the double-action type, the first opening moving the blade in a horizontal plane, and after clearing the contact it is then raised vertically.



GANG-OPERATED DISCONNECTING SWITCH OF THE DOUBLE-ACTION TYPE AVAILABLE IN A VOLTAGE RANGE FROM 33 KV. TO 110 KV.

Self-Starting Squirrel-Cage Motor

A new type of Hanson-Oesterlein self-starting squirrel-cage motor, having a single-rotor winding with the rotor bars near the surface, thus insuring minimum magnetic leakage, has been developed by the Northwestern Manufacturing Company, Milwaukee. The rotor bars are connected on the end with low-resistance arc-welded copper end rings. These are partly surrounded by steel laminations. A separate magnetic circuit thus controls the starting characteristics of the motor and is entirely independent of the rotor and stator fields. For motors requiring a high starting torque high-resistance end rings are placed next to the rotor cove. During the starting period the high impedance in the low-resistance end rings prevents the flow of current in them and forces it through the high-resistance end rings, producing a high starting torque. As the speed increases the impedance in the low-resistance end rings decreases and the total torque increases until the rotor reaches full speed.

These motors, known as the type H-O, are regularly built for two torque ratings, one having 130 per cent starting torque and the other 200 per cent starting torque. The company states that the efficiency of these motors is high and is the same as its standard type H motor, but the power factor is slightly less.

New Line of Double-Control Panels

A new General Electric line of double-control panels is designed to govern motors driving house, sprinkler, sump and circulating pumps in hotels, office buildings, large apartment houses, etc. Each panel consists of a composition base supported on angle-iron frames for floor mounting. When the panel is used to control one motor, it usually contains one fused line switch, two starters, one test switch for each magnetic starter and one transfer switch. For the control of two motors another line switch is added. Undervoltage release and overload protection are furnished for each starter. When controlling one motor, the transfer switch allows the transfer of the motor from one starter to the other. When controlling two motors, either motor may be transferred to either starter. The new line of double panels covers both alternating and direct current.

Boiler-Gage Light. — A boiler-gage light, consisting of a tubular reflector with a bayonet attachment to the socket flange, has been placed on the market by the Westinghouse Electric & Manufacturing Company. A compression spring serves to maintain the connection and to hold the lamp in place, so that neither the reflector nor the lamp can loosen under vibration.

New Trade Publications

TURBINES. — The Standard Turbine Corporation, Scio, N. Y., is distributing bulletin No. 13, covering its steam turbines for pumps, fans and other applications. It contains illustrations of various types of the turbine and a drawing showing a section through a standard-frame D turbine.

FRICTION AND INSULATING TAPES. —A booklet issued by the United States Rubber Company, 1,790 Broadway, New York City, describes its friction and insulating tapes. A partial list of mechanical rubber products manufactured by the company is included.

ELECTRIC TRUCKS.—A series of new booklets have been issued by the Commercial Truck Company, 300 Hunting Park Avenue, Philadelphia, calling attention to the advantages of the use of electric trucks in the bakery, department-store, ice-cream, laundry and milk industries.

AIR FILTERS. — Bulletin No. 2,223 issued by the American Blower Company, Detroit, describes and illustrates the "Sirocco" air filter for ventilation and air purification in telephone exchanges, transformers, generators, schools, theaters, factories, etc., and for dust removal in enameling and painting rooms, gas and oil engines, air compressors, etc.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Puerto Varas, Chile (No. 22,629), for self-contained lighting outfits.

An agency is desired in Puerto Varas, Chile (No. 22,629), for radio tube sets.

An agency is desired in Goerlitz, Germany (No. 22,656), for electrical hotel and restaurant equipment.

Purchase is desired in Leipzig, Germany (No. 22,673), of wiring material, such as switches, conduits, and fuses.

Purchase is desired in Leipzig, Germany (No. 22,673), of electrical household appliances, especially novelties.

An agency is desired in Belfast, Ireland (No. 22,674), for electrical equipment for automobiles.

An agency is desired in Belfast, Ireland (No. 22,674), for novelty electric lamps.

An agency is desired in Belfast, Ireland (No. 22,674), for electric lighting fixtures.

An agency is desired in Melbourne, Australia (No. 22,675), for electric household appliances.

An agency is desired in Melbourne, Australia (No. 22,676), for window advertising flash electric signs.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

MANCHESTER, N. H.—The Public Service Company of New Hampshire, Inc., recently organized to take over the Manchester Traction Light & Power Company, Keene Gas & Electric Company and other utilities in this section, contemplates extensions in transmission lines in the vicinity of Manchester, Laconia and Milford.

INDIAN ORCHARD, MASS.—The Chapman Valve Manufacturing Company plans to install electric power equipment in its proposed plant addition, to cost about $500,000.

WHITMAN, MASS.—The installation of an improved street-lighting system in the business district is under consideration.

Middle Atlantic States

BLOOMING GROVE, N. Y.—Permission has been granted the Orange & Rockland Electric Company, Monroe, for the transfer of an electric franchise granted the Central Hudson Gas & Electric Company by the local Town Board to supply electric service here. The Public Service Commission has also authorized the Orange & Rockland company to construct an electric plant in the town.

BUFFALO, N. Y.—Preliminary plans are under advisement for improvements in the lighting system in the Fernhill section. The St. Clements Community Mens Club is at the head of the project.

GEORGETOWN, N. Y.—Permission has been granted the New York State Gas & Electric Company, Ithaca, to extend its electric system in Georgetown, and also approval of the franchise granted by the town.

ILION, N. Y.—The village officials have applied to the Public Service Commission for authority to extend the transmission lines of the municipal electric light plant into the town of Frankfort to supply electricity in a lighting district to be created there.

MASPETH, L. I., N. Y.—The Sterling Casket Hardware Company, 383 Kent Avenue, Brooklyn, will install electric power equipment at its proposed one-story plant on Grand Avenue, estimated to cost $110,000. Harry Harvie, 370 Seventh Avenue, New York, is architect.

MINETTO, N. Y.—Steps have been taken by C. P. Stevens and John Barrett for the installation of a street-lighting system in the village.

NEW YORK, N. Y.—Bids will soon be asked by the New York Edison Company, for an addition to its six-story office, service and operating building, 50 ft. x 100 ft., at 177th Street and Monterey Avenue, reported to cost more than $75,000. William Whitehill, 709 Sixth Avenue, is architect.

ROCHESTER, N. Y.—Extensions are contemplated by the Rochester Gas & Electric Company to its station No. 5, located at the Lower Falls of the Genesee River, to cost about $1,100,000. The work will include an extension to the power station and the installation of a 20,000-hp. turbine, etc.

SAG HARBOR, N. Y.—The installation of additional street lamps throughout the village early in 1927 is under consideration by the Board of Village Trustees.

SYRACUSE, N. Y.—The Syracuse has applied to the Public Service Commission for permission to exercise a franchise granted by the town of Cazenovia for the erection of a high-tension transmission line through a portion of the town to reach the property of the Rock Cut Stone Company.

CAMDEN, N. J.—The installation of an improved lighting system on Mount Ephraim Avenue, is under consideration by the Mount Ephraim Business Mens' Association. 1559 Mount Ephraim Avenue.

KEYPORT, N. J.—Extensions and improvements are contemplated to the waterworks pumping station, including the installation of new pumping machinery.

FAWN GROVE, PA.—The Glen Rock (Pa.) Electric Company, is negotiating for the purchase of the plant of the Fawn Light & Power Company. If taken over the company plans expansion in this district, including extension of transmission lines.

FRANKLIN, PA.—The Chicago Pneumatic Tool Company, 6 East Forty-fourth Street, New York, plans to install electric power equipment in its proposed new plant unit, for the production of Diesel engines, to cost about $350,000.

MEYERSDALE, PA.—The Penn Public Service Company, Johnstown, which recently acquired the properties of the Meyersdale Electric Light, Heat & Power Company, contemplates extensions in its transmission line to Meyersdale and vicinity from the present terminus about 5 miles from the city.

PARKESBURG, PA.—The Pennsylvania Railroad Company, Philadelphia, Pa., is said to be planning the electrification of its line. The company is also considering the electrification of its system in the vicinity of Paoli and Lancaster.

PHILADELPHIA, PA.—The Baltimore & Ohio Railroad Company, Baltimore, is planning the electrification of part of its lines in the Philadelphia city limits to cost about $15,000,000. Of this amount about $5,000,000 will be used for a new passenger terminal at Twenty-fourth Street, with power house, pumping stations, etc.

PHILADELPHIA, PA.—The Department of City Transit has plans for a one-story and basement power substation at Park Avenue and Cumberland Street, to cost about $65,000.

PHILADELPHIA, PA. — The Reading Company, Reading Terminal, operating the Philadelphia & Reading Railway, is said to be planning the construction of a one-story power substation at 1117 Arch Street.

ROCK HILL, PA.—The Rock Hill Light & Power Company, recently chartered under state laws, is reported to be considering extensions in transmission lines, to include a number of neighboring communities.

WORMLEYSBURG, PA.—The installation of additional street lamps in the borough is under consideration by the Borough Council.

ROMNEY, W. VA —The Potomac Valley Power Corporation, recently organized by officials of the Atlantic Public Utilities, Inc., 70 State Street, Boston, to take over the properties of the Romney Electric Company and other utilities in this section. Plans, it is said, are under way for extensions in transmission lines, and rebuilding part of the present system.

WASHINGTON, D. C.—Bids are being asked by the Bureau of Yards and Docks, Navy Department, Washington, (no closing date stipulated) for one 150-kw., engine-driven direct-current generator for the local naval hospital, installed on foundation provided by the government (Specification 5293).

North Central States

DETROIT, MICH.—Plans are being prepared by Smith, Hinchman & Grylle, 800 Marquette Building, engineers, for the construction of an exchange building on Coon Avenue for the Michigan Bell Telephone Company, to cost about $750,000.

EAST LIVERPOOL, OHIO.—The City Council has authorized a ten-year lighting contract with the Ohio Power Company, which proposes extensions and betterments, including transmission line construction.

YOUNGSTOWN, OHIO.—The Trumbull Steel Company plans the installation of electric power equipment in connection proposed extensions and improvements in its local mills, to cost $1,500,000.

LOUISVILLE, KY.—The Federal Flourspar Company, 312 South Sixth Street, is reported to be planning the construction of a power plant in connection with grinding mill at its Flourspar properties.

LOUISVILLE, KY. — Electric power equipment will be installed in the proposed additions to be made in the local plant of the Vogt Refrigerator Company, which has been acquired by the General Necessities Company, Detroit. The cost of the work is estimated at $500,000.

MANNINGTON, KY.—The Mannington Fuel Company plans to install electric power equipment at its plant, including motor-generator set and auxiliaries.

NEWBURGH, IND.—The United States Engineer Office, Louisville, Ky., has preliminary plans under way for the construction of a power plant at the Ohio River Dam No. 47, Newburgh, estimated to cost $35,000. Bids will soon be asked.

CHICAGO, ILL.—The International Harvester Company, 606 South Michigan Avenue, is planning to build an extension to its power house, to cost about $30,000.

PANA, ILL.—Arrangements are being made by the Central Illinois Public Service Company, Springfield, for the installation of a new street-lighting system in the downtown section. The plans provide for seventy-five standards, mounted with lamps of 250 cp.

WATERTOWN, ILL.—Plans are being prepared by the State Architectural Department, Springfield, for a new power house at the Watertown State Hospital, to cost about $200,000.

GREEN BAY, WIS.—Plans have been adopted by the Wisconsin Public Service Corporation to extend its transmission line from Valmy to Jacksonport, thence west to Peninsular Center. Here the line will be divided, one branch continuing west to Egg Harbor and the other leading to Baileys Harbor. The total mileage of the new extension will be 23½ miles. Upon completion of these extensions the corporation will take up the question of building an extension from Egg Harbor to the towns of Fish Creek and Ephraim.

MADISON, WIS.—The Common Council is considering a petition requesting the installation of an ornamental street lighting system on University Avenue from Gilman to State Street.

MILWAUKEE, WIS.—The Charles A. Krause Milling Company plans to install electrically operated machinery in its proposed new plant, to cost about $250,000.

RACINE, WIS.—Steps have been taken by the West Racine Business Men's Association for the installation of an improved lighting system in the business section of West Racine.

RIPON, Wis.—The Wisconsin Power & Light Company is completing arrangements for the construction of a power line between Poy Sippi and Winneconne. This line will be 11,400 volts and will extend 17 miles.

SHEBOYGAN, WIS.—Bids are being advertised by the city of Sheboygan on a new ornamental street lighting system on North Third st. boulevard.

STOUGHTON, WIS.—Plans for the rebuilding and reconditioning of the Dunkirk hydro-electric plant are under consideration by the City Council.

HIBBING, MINN.—The Minnesota Power & Light Company has plans under way for the construction of a transmission line from Nashwauk to this place, to operate at 110,000 volts. It is also proposed to make improvements in substations at Nashwauk, including installation of additional equipment.

BURLINGTON, IOWA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 17 for conduit and wiring and lighting fixtures at the United States post office, Burlington. For details see Searchlight section.

SHELDON, IOWA.—The Iowa Light, Heat & Power Company, Carroll, is planning for extensions and improvements in its local power plant; also in transmission lines to Archer, Hospers, Royden and vicinity. The entire program will cost about $65,000.

SIBLEY, IOWA.—The City Council is considering extensions and betterments in the municipal electric light and power plant to cost about $56,000, including additional equipment.

BRANSON, MO.—The Taney Light & Water Company has secured a renewal of its franchise with the city for a period of twenty years and is reported planning improvements in system, including street lighting.

ST. LOUIS, MO.—Plans are being prepared by the Southwestern Bell Telephone Company for an addition to its telephone exchange building at Eleventh and Oak Streets, to cost about $600,000. Holt, Price & Barnes, 800 Davidson Building, are architects.

MAYVILLE, N. D.—The City Council has approved plans for the immediate installation of an ornamental lighting system in the downtown district, with underground cable installation.

WHITE RIVER, S. D.—The village of White River has applied to the Federal Power Commission for a license covering a 115-hp. project on Little White River.

FAIRBURY, NEB.—Plans are being considered by the City Council for extensions and improvements in the municipal electric lighting plant and waterworks.

GIBBON, NEB.—The Central Power Company, Grand Island, is reported to be planning for extensions in its transmission line for commercial light and power service.

MEDICINE LODGE, KAN.—The City Council will soon ask bids for the installation of an ornamental lighting system on two main streets in the business section.

TOPEKA, KAN.—The Board of Trustees, St. Mary's College, has preliminary plans under consideration for a power plant, estimated to cost $50,000. The S. A. Sulentic Consulting Engineering Company, New England Building, Kansas City, Mo., is consulting engineer.

Southern States

ASHEVILLE, N. C.—The Board of City Commissioners is disposing of a bond issue of $44,000, the fund to be used for extensions and improvements in the lighting system.

COLERAIN, N. C.—The towns of Colerain and Harrellsville are considering erecting a transmission line to Ahoskie, a distance of about 20 miles, and installing a lighting system.

TRYON, N. C.—The General Gas & Electric Company, New York, N. Y., is reported to be planning for extensions in transmission lines. The company recently acquired the Melrose Power & Manufacturing Company.

MACON, GA.—The installation of new pumping equipment at the municipal waterworks, to cost about $50,000, is under consideration by the City Council.

VILLA RICA, GA.—The Georgia Railway & Power Company, Atlanta, has acquired the local plant and system of the Villa Rica Electric Light & Power Company, and contemplates extensions and improvements, including transmission line construction.

WAYCROSS, GA.—The Ware County Light & Power Company contemplates extensions in its transmisison line on Carswell Avenue.

BILOXI, MISS.—The installation of an ornamental lighting system in under consideration by the City Council.

BROOKHAVEN, MISS.—The Mississippi Power & Light Company, Jackson, which is negotiating for the purchase of the municipal electric plant, plans to erect a transmission line for local service.

DREW, MISS.—The Mississippi Power & Light Company, Jackson, is said to be planning extensions in its transmission line. The company has recently acquired the municipal lighting plant.

McCOMB, MISS.—The Mississippi Power Company, Gulfport, which owns the local system, contemplates rebuilding the electric lines in East and West McComb.

NEW ORLEANS, LA.—The New Orleans Public Service, Inc., has filed plans for the construction of a two-story service and mechanical works at Perdido and Magnolia Streets, including meter shop, machine repair shop, jobbing department, etc., estimated to cost $50,000.

WELEETKA, OKLA. — The Oklahoma Power Company, Okmulgee, has started work on the construction of a new generating station on the Canadian River at Weleetka, with an initial generating capacity of 15,000 kw. The new plant will serve a group of communities in the vicinity of Okmulgee and Henryetta.

BROWNSVILLE, TEX. — The Valley Electric & Ice Company, San Benito, is negotiating for the purchase of the municipal electric light plant. If taken over the local system will be connected with the transmission system of the company.

BURNET, TEX.—The Texas Power & Light Company, Waco is considering the erection of a high-tension transmission line from Burnet to Lampasas, and to erect a substation at Post Mountain.

COMMERCE, TEX.—Plans are being prepared by the Louisiana Ice & Security Building, St. Louis, for a local ice manufacturing plant with an initial capacity of 35 tons per day. George S. Wells, Security Building, is engineer.

DENTON, TEX.—Extensions to the municipal electric plant are under consideration, including the installation of a 350-hp. gas engine.

ELGIN, TEX.—The erection of a high-tension transmission line between Elgin and Manor is under consideration by the Texas Public Utilities Company, Dallas.

HOUSTON, TEX.—A contract has been awarded by the Myers-Spalti Manufacturing Company 2115 Runnels Street, for the erection of an addition to its factory building, to cost about $40,000, to be utilized as a machine shop and power house.

SAN ANTONIO, TEX.—At an election to be held Nov. 15 the proposal to issue $75,000 for the installation of a refrigerating plant in the municipal auditorium will be submitted to the voters. I. Ewig is city engineer.

Pacific and Mountain States

ABERDEEN, WASH.—In connection with a budget for municipal improvements for 1927, the City Council has approved an appropriation of $2,000,000, for the construction of its proposed municipal hydro-electric power plant, for which plans will soon be consummated.

SPOKANE, WASH.—The Washington Water Power Company has filed plans for the construction of a one-story substation at Twenty-fifth and Arthur Streets.

BEND, ORE.—The Arnold Irrigation Company contemplates the construction of a power plant in connection with a proposed irrigation system in the Arnold Crane Prairie District, using the west fork of the Deschutes River as source of supply. The project will cost $200,000. Application for permission has been made.

GOLD HILL, ORE.—Plans are being prepared by the Beaver Portland Cement Company, for the construction of a hydro-electric plant for service at its mill, to cost about $150,000. Floyd W. Allen, Railway Exchange Building, Portland, is engineer. Owing to a typographical error this item was published under Gold Mill, instead of Gold Hill, in the issue of Oct. 16.

CALEXICO, CAL.—A proposition is under consideration for the installation of an ornamental lighting system in the downtown district. The Chamber of Commerce is at the head of the project.

GLENDALE, CAL.—The City Council has adopted a resolution providing for the installation of an ornamental lighting system on portion of Geneva Street.

LOMPAC, CAL.—The Puritan Ice Company plans the installation of electric power equipment in its proposed ice-manufacturing plant on local site, to cost approximately $150,000.

LOS ANGELES, CAL.—The American Laundry Machine Company plans the installation of electric power equipment in its proposed three-story plant at Fourth and Anderson Streets, to cost approximately $100,000, with machinery. Headquarters of the company are at Cincinnati, Ohio.

LOS ANGELES, CAL.—At a recent special election the voters approved the proposal to issue $21,000,000 in bonds for extensions to the municipal electric and water facilities. Of this amount $11,000,000 will be used to carry out three major expansion programs: (1) Development of 28,000 hp. additional hydro-electric energy along the Owens River aqueduct; (2) acquisition of rights-of-way and the construction of tower lines and two new electric stations as a part of a high-voltage transmission system which will ultimately circle the city; (3) Purchase of privately owned electric distribution lines in recently annexed districts.

PASADENA, CAL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 9 for the installation of one full magnet control electric freight elevator in the United States post office, Pasadena. For details see Searchlight Section.

SAN DIEGO, CAL.—The City Council has adopted a resolution providing for the installation of an ornamental lighting system on a portion of Adams Avenue, using pressed-steel standards.

SAN JOSE, CAL.—The City Council has plans in progress for the installation of an ornamental lighting system on North First Street, between Rosa Street and the line of the Southern Pacific Railroad. William Popp is city engineer.

MALAD, IDAHO.—The installation of a new street-lighting system is under consideration by the town officials.

CEDAR CITY, UTAH.—The Dixie Power Company contemplates building a supplementary hydro-electric plant on the Santa Clara River, below its present No. 2 station, to develop 800 kw. The cost is estimated at $200,000.

MURRAY, UTAH.—The installation of a new ornamental lighting system is under consideration by the Town Council. The plans provide for fifty-four standards.

OGDEN, UTAH—The City Council is considering a petition for the installation of an ornamental lighting system on Washington Avenue from Twenty-second to Twenty-sixth Streets, and adjoining important thoroughfares.

REDSTONE, MONT. — The Montana Power Company, Butte, is reported to be arranging for extensions in transmission lines from Plentywood to Redstone, Midbey, Archer, Flaxville terminating at Opheim, Mont., for commercial light and power service. At a later date, the company purposes to construct a transmission line from Glendive to Fairview.

SCOBEY, MONT.—The Montana-Dakota Electric Company has plans for the construction of a transmission line to this vicinity.

Canada

CALGARY, ALTA.—The City Council has plans for the immediate construction of a one-story municipal electric lighting plant, reported to cost about $15,000.

WINNIPEG, MAN.—Alterations in the original plans for extensions of the Hydro system in the Southern Manitoba have been decided upon by the Provincial Hydro Commission, which will reduce the original expenditure from $250,000 to about $150,000. Tenders for the proposed work will be called during the winter months.

SHERBROOKE, QUE.—The City Council plans to develop the Westbury power site at a cost of about $500,000. The project will include the construction of a dam and power station.

Electrical Patents

Announced by U. S. Patent Office

(Issued Sept. 28, 1926)

1,601,330. SPEED REGULATOR SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed Feb. 19, 1921. Adapted to maintain a substantially constant-speed ratio between a plurality of movable members.

1,601,331. CROSSING FOR TROLLEY CONDUCTORS; P. G. Swars, Pittsburgh, Pa. App. filed Oct. 29, 1925.

1,601,336. CONTROLLER; B. O. Austin, Wilkinsburg, Pa. App. filed May 10, 1922. For governing remotely-controlled switches. A device for opening a circuit that governs a line switch, upon a slight reverse movement of a controller drum.

1,601,341. REGULATOR SYSTEM; C. E. Braun, Camas, Wash. App. filed June 10, 1922. Load-regulating system.

1,601,346. LIMIT SWITCH; T. J. Callahan, Dayton, O. App. filed Feb. 25, 1924.

1,601,358. SPECTRUM LAMP; T. P. Hall, Vancouver, B. C. App. filed March 31, 1925. For therapeutic use.

1,601,363. APPATATUS FOR TESTING INDUCTIVE TRAIN CONTROL DEVICES; W. K. Howe, Rochester, N. Y. App. filed March 4, 1922.

1,601,380. CIRCUIT BRAKING DEVICE; E. B. Swerdfeger, Denver, Colo. App. filed May 10, 1924. A fluid operated circuit breaker. A switch primarily intended for use in connection with fluid cooled electrical apparatus in which it is essential that an electric circuit should be broken in the event of any disarrangement of the fluid cooling circulation system to prevent damage to the apparatus by reason of the undue heating of the same.

1,601,383. LIQUID TESTING APPARATUS; E. W. Todd, Mitchell, Neb. App. filed June 23, 1925. For testing liquids for acidity or alkalinity.

1,601,410. PHASE AND FREQUENCY CONVERTER; B. Nordfeldt, Blasbo, Vasteras, Sweden. App. filed Jan. 11, 1923. The conversion of polyphase current into single phase, and having an arrangement which simultaneously changes the frequency of said current. The invention is based upon the principle of connecting together two voltage polygons, for instance voltage triangles, at two points, while the phase sequence of the polygons is such that in a vector diagram they will lie opposite to one another. According to the invention, such voltage polygons or other analogous thereto, are obtained from windings arranged on one machine or on mechanically connected machines.

1,601,457. DRY CELL AND DEPOLARIZING COMPOSITION THEREFOR; E. C. Smith, Fremont, O. App. filed Dec. 30, 1922. Using regulated quantities of non-conductive, non-oxidizing, absorptive materials.

1,601,470. REFLECTING ELECTRIC LAMP; H. H. Collins, Cincinnati, O. App. filed Sept. 15, 1922. Of the filament type in which light rays which would ordinarily be projected toward the base of the lamp and be spent without any appreciable illuminating effect, will be reflected in such a manner as to obtain the full benefit therefrom.

1,601,475. DRY CELL AND DEPOLARIZER THEREFOR; G. W. Heise, Bayside, N. Y. App. filed June 17, 1924.

1,601,500. METHOD OF ELECTRIC FORMATION OF OXIDES OF NITROGEN; J. S. Island, Merritton, Ont., Can. App. filed Aug. 18, 1924.

1,601,511. PROCESS OF CLEANING ARTICLES; F. C. Schmutz, Matawan, N. J. App. filed April 3, 1923. Cleaning from metallic articles compounds which have been deposited thereon during manufacturing processes or otherwise, particularly in the case of articles consisting of nonferrous metals or alloys which are liable to become discolored or tarnished if subjected to the action of a cleaning agent which is too highly alkaline.

1,601,528. ELECTROPLATING MACHINE; W. F. Hall, Matawan, N. J. App. filed Dec. 2, 1925. Designed to automatically pass articles to be plated into, along, and out of an electroplating bath.

1,601,531. ELECTRIC-MOTOR CASING; H. W. Jeannin, Toledo, O. App. filed May 11, 1925. Motors having gas-proof casing and which are used in dusty, explosive, damp or other deleterious atmosphere.

1,601,606. COMBINATION TEST PANEL AND POLYPHASE METER TRIM; F. J. Waller, Santa Ana, Calif. App. filed April 5, 1923. A unitary structure which shall not only prevent the exposure of conductive elements connected with a meter but which shall also include means to facilitate the testing of meters, and especially polyphase meters, without interruption of service.

1,601,607. LIGHT SENSITIVE ELECTRICAL RESISTANCE DEVICE; S. Wein, New York, N. Y. App. filed Oct. 18, 1924. Photo electric cell.

1,601,642. APPARATUS FOR THE ELECTRODEPOSITION OF METALS ON WIRE OR NARROW STRIP; J. A. Parker, Cwmbran, Wales. App. filed March 19, 1926.

1,601,691, 1,601,692, 1,601,693, 1,601,694. ELECTROLYTIC DEPOSITION OF METALS; M. M. Merritt, Middletown, Mass. App. filed Aug. 20, 1925. Methods and apparatus for making sheet metal by electrodeposition.

1,601,703. PROCESS AND APPARATUS FOR SUPPLYING HEAT TO MOLTEN MATERIAL; C. T. Patterson, Syracuse, N. Y. App. filed March 6, 1925. Electric resistance furnace in which the material to be heated forms the resistance element and particularly furnaces of this type for materials such as metallic salts whose heat capacity and heat conductivity are relatively poor compared with that of metals and metallic substances.

1,601,704. MATERIAL RETAINING DEVICE FOR STORAGE BATTERIES; W. B. Stone, Webster, Mass. App. filed Jan. 20, 1926.

(Issued Oct. 5, 1926)

1,601,726. FUSE; A. L. Eustice, Chicago, Ill. App. filed Feb. 15, 1922.

1,601,743. FLOW METER; J. M. Spitzglass, Chicago, Ill. App. filed Oct. 9, 1919. For measuring the flow of fluids.

1,601,744. THERMOMETER; J. M. Spitzglass, Chicago, Ill. App. filed March 15, 1920. May be used to indicate temperatures at a distance from the point at which the temperature is measured.

1,601,766. AERIAL TRAFFIC CONTROL; L. H. Peter, London, Eng. App. filed March 9, 1920.

1,601,817. TELEPHONE CABLES; J. Forster, Vienna, Austria. App. filed Feb. 3, 1923. A telephone cable comprising in combination a conductor, an insulating cord for said conductor, said insulating cord comprising a central cord of fibrous material and a plurality of cords of fibrous material wound helically around said central cord, said insulating cord being wound helically around said conductor and having its convolutions spaced apart.

1,601,840. SHUNT; D. J. Angus, Indianapolis, Ind. App. filed July 24, 1925. As used for measuring large currents; means for reducing errors.

1,601,834. ELECTRIC DISCONNECTOR; G. C. Oxer and M. M. Samuels, New York, N. Y. App. filed Nov. 6, 1922. Gong-operated disconnecting switch.

1,601,871. ELECTRIC WELDING MACHINE; J. W. Meadowcroft, Philadelphia, Pa. App. filed Nov. 24, 1925. Spot-welding machines.

1,601,902. SEALING-OFF MACHINE; C. Bol, Eindhoven, Netherlands. App. filed Feb. 14, 1924. Apparatus for sealing off a number of parallel glass tubes of bulbs for electric lamps and other vessels to be exhausted, after said bulbs have been exhausted, and provided, if necessary, with a suitable gaseous filling.

1,601,904. ATTACHMENT PLUG; N. C. Butler, Cleveland Heights, Ohio. App. filed Sept. 25, 1919.

1,601,922. POLYPHASE RELAY; J. C. McDonald, New York, N. Y. App. filed March 24, 1924.

1,601,926. FUSE HOLDER; D. E. Simpson, Schenectady, N. Y. App. filed May 28, 1924. Embodying a closed protective casing for the fuse and contact parts.

1,601,927, 1,601,928, 1,601,929. LINE WELDING; H. W. Tobey, Pittsfield, Mass. App. filed Aug. 27, 1923, Nov. 8, 1924, and Aug. 27, 1923. The production of circumferential welds of the type encountered, for example, in welding the head on a drum or tank, or the welding together of sections of such articles.

1,601,934. ROTATABLE ELECTRICAL APPARATUS; A. F. Welch, Fort Wayne, Ind. App. filed Oct. 23, 1922. System for obtaining continuous power using two sources. In combination, a source of current, a motor adapted to be connected thereto, a second source of current, a second motor adapted to be connected to said second source of current, said motors being mechanically connected together, said second motor having a field winding, a commutator and brushes, said brushes being normally out of contact with said commutator, electroresponsive means for bringing them into contact with said commutator, said electroresponsive means and said field winding being connected in series and being energized upon the occurrence of abnormal conditions in said first source.

1,602,039. BATTERY CONNECTOR FOR USE IN CHARGING STORAGE BATTERIES; J. R. Moyer, Scranton, Pa. App. filed Feb. 29, 1924.

1,602,043. ARRANGEMENT FOR CARRYING OFF HEAT; E. Pfiffner, Budapest, Hungary. App. filed May 5, 1924. An arrangement for carrying off heat in an electric device, comprising in combination a casing containing a cast insulating material which has electric and thermal insulating properties, a system of coils arranged in the casing and embedded in said material, and plates having high heat-conducting properties disposed in said material in such manner that the plates are arranged as far as possible in the equipotential surfaces of the electric field.

1,602,065. REPEATER; C. E. Beach, Binghamton, N. Y. App. filed Feb. 28, 1921. For signaling circuits whereby signals initiated on any one of a plurality of circuits will be repeated over other one or more circuits.

1,602,070. SELENIUM CELL WITHOUT INERTIA; G. Dragonetti, Rome, Italy. App. filed Jan. 31, 1924.

1,602,088. CIRCUIT INTERRUPTER; M. H. Shoenberg and L. Schon, San Francisco, Cal. App. filed Nov. 22, 1924. Thermally actuated means for making and breaking the circuit periodically; actuated by the heat generated by the flowing current during the period of circuit conductivity.

1,602,100. ELECTRIC ARC LAMP; T. L. Carbone (deceased), late of Berlin, Germany. App. filed Nov. 25, 1922.

1,602,221. ELECTRIC CONNECTOR; C. E. Godley, Detroit, Mich. App. filed March 26, 1925. Used on low-voltage circuits, as on automobiles, etc.

1,602,225. ELECTRIC HEATER; J. J. Gough, Chicago, Ill. App. filed Nov. 12, 1925. Bowl-type heater.

1,602,227. FUSE HOLDER; C. T. Hentschel, Schenectady, N. Y. App. filed July 9, 1924. Embodying a closed protective casing for the fuse and contact parts such that the fuse may be easily and quickly inserted and removed.

1,602,238. MERCURY-VAPOR APPARATUS; K. Mensing, Hanau-on-the-Main, Germany. Quartz lamp for operation by alternating current.

1,602,245. MERCURY-VAPOR LAMP; J. Nisbit, Glasgow, Scotland. App. filed Sept. 21, 1925. Used for projecting pictures.

1,602,297. ILLUMINATING MEANS FOR TOY RAILWAY CARS; H. S. Becker, Chicago, Ill. App. filed Feb. 16, 1926.

1,602,300. AUTOMATIC SIGNAL; J. H. Grant, West Haven, Conn. App. filed Oct. 12, 1923. For use in connection with refrigerators to give an automatic signal when the drip pan of the refrigerator is about to overflow.

1,602,318. ELECTRIC SWITCH; C. E. Anderson, Stratford, Conn. App. filed July 15, 1924. Switch of the key-operated type using a toggle switch mechanism.

1,602,370. ELECTRICAL RECEPTACLE; C. E. Avery, East Orange, N. J. App. filed Dec. 6, 1922. For attachment plugs of the spaced blade type.

(Issued Oct. 12, 1926)

16,438 (reissue). BATTERY CHARGER; E. W. Engle, Lake Forest, Ill. App. filed Aug. 19, 1922. Adapted to be used to charge storage batteries from a source of alternating current.

1,602,402. BATTERY; O. S. Flath, Chicago, Ill. App. filed Feb. 16, 1922. Primary batteries employing cylindrical or tubular forms of positive and negative elements; means whereby the positive and negative elements may be insulatedly secured together in proper spaced relation to constitute a unit adapted to be supported or suspended by a single element from the cover of the jar or vessel which contains the electrolyte or caustic soda and oil solution.

1,602,444. FLUID METER; J. M. Naiman, Chicago, Ill. App. filed June 16, 1919.

1,602,502. FLUID-STAGE-ACTUATED CIRCUIT CLOSER; J. D. Pirtle, Chicago, Ill. Indicator to be applied to a tank or container of fluid preferably embodied in form for indicating at a distant point the stage or surface level of the fluid; has for its object the provision of means whereby the several stages to be indicated will be impressed upon the attention of the observer by an independent signal unit for each stage.

In Two Sections— ELECTRICAL WO
October 30, 1926

National Refriger

Editors of ELECTRICAL WORLD have tabulated detailed returns of a national survey of the electrical refrigeration situation. The 50,000 items in these tables were obtained through first-hand visits of editors to more than 200 communities and is presented as received by the unbiased investigators. The tabulation should give the electrical industry data whereby electrical refrigeration can develop even mo construc tables a four sec Each se columns or left-h sheet.

SOUTHERN STATES

Quality	Approximate Number of Domestic Customers	Number of Electric Refrigerators: On Lines	Commercial	Domestic	Total Estimated Sales For 1927	Central-Station Executive Reaction to Electric Refrigeration	Relations With Ice Industry	Total Number Electric Refrigerator Selling Outlets	Total Number Electric Refrigerator Salesmen	Local Selling Outlets: Make	Type of Dealer	Number in Sales Staff	Time in Refrigera Busine: Years
1	60,000	785	185	600	1 800	Favorable	Good	..	..	B	Cent. sta.	11	1
2	65,000	2,100	300	1,800	3,800	Favorable	Fair	12	..	B	Distrib.		
3	4,500	100	40	600	200	Fair	Fair	3	..	C-B-D T B	Cent. sta. Elect. contr. Elect. contr.	4 1	2
4	45,000	1,050	250	800	1,000	Good	Good	4	..	A-B-C	Cent. sta.	4	1
5	38,000	1,600	350	1,250	5,250	Good	Fair	6	..	A-B-C Feat. B B C A A F G	Cent. sta. Distrib. Hdwe. dealer Distrib. Furn.-dealer Appli. dealer Dealer	5 18	
6	3,000	150	50	100	150	Good	Good	4	..	B-C C C A-D	Cent. sta. Elect. dealer Elect. dealer Elect. contr.	3	1
7	5,500	100	35	65	325	Good	Fair	3	..	A B C	Cent. sta. Elect. dealer Spl. dealer	4 1	1
8	8,000	700	100	600	1,000	Favorable	Good	2	..	A B	Cent. sta. Elect. dealer	.. ..	1
9	12,000	825	100	725	1,150	Favorable	Fair	3	..	B B A	Cent. sta. Spl. dealer Elect. dealer	3	
10	7,000	250	50	200	850	Favorable	Good	7	..	B B B B C F T	Cent. sta. Distrib. Spl. dealer Radio dealer Elect. dealer Furn. dealer Elect. dealer	5	
11	6,500	175	60	115	750	Favorable	Good	3	..	A B C	Cent. sta. Spl. dealer Elect. dealer	1	1
12	7,500	175	75	100	550	Fair	Fair	4	..	B A C F	Spl. dealer Elect. dealer Radio dealer Furn. store	.. ..	1
13	4,500	350	75	275	400	Good	Good	4	..	A B T A	Cent. sta. Spl. dealer Elect. dealer Distrib.	1, 3 part	1
14	8,000	250	50	200	500	Fair	Good	4	..	C A B F	Cent. sta. Elect. dealer Spl. dealer Elect. dealer	9	
15	5,000	150	50	100	650	Poor	Fair	3	..	A B F	Distrib. Spl. dealer Spl. dealer	.. .. ..	2
16	7,000	200	50	150	400	Good	Fair	3	..	A B T	Cent. sta. Elect. dealer Elect. dealer	.. .. ..	1
17	17,000	625	175	450	1,100	Fair	Good	5	..	C A S F B	Cent. sta. Distrib. dealer Drug co. Plumber Distrib. dealer	2 5	1
18	21,000	800	225	575	800	Very good	Very good	5	..	B D A N 1-A	Cent. sta. Music dealer Oil burner dealer Hdw. dealer Spl. dealer	8	4
19	15,000	1,100	400	700	1,200	Very good	Fair	6	..	B A S F G Y	Cent. sta. Supply job. Spl. dealer Spl. dealer Hdw. dealer Supply job.	6 4	
20	4,000	90	50	40	125	Fair	Good	3	..	C A B	Cent. sta. Elect. dealer Hdw. dealer	.. .. ..	2 1
21	1,700	65	25	40	125	Fair	Fair	2	..	B C	Spl. dealer Elect. dealer	.. ..	2
22	1,000	75	35	40	125	Poor mun. pl.	.....	2	..	B A	Spl. dealer Furn. dealer	.. ..	
23	11,000	150	50	100	350	Fair	Good	4	..	C B F T	Cent. sta. Distrib. dealer Hdw. dealer Elect. dealer	5	
24	7,000	100	25	75	150	Favorable	Good	3	..	C B A	Cent. sta. Spl. dealer Garage	6 4 1	2
25	1,000	1	...	1	10	Poor	Good	1	1	C	Cent. sta.	1	
26	2,000	60	20	40	100	Fair	Good	2	7	A B	Cent. sta. Spl. dealer	4 3	2 2
27	20,000	295	95	200	300	Very poor	Fair	3	..	B	Spl. dealer	10	1
28	5,000	155	30	125	150	Fair	Good	3	..	D B A	Cent. sta. Distrib. dealer Spl. dealer	.. .. ..	3
29	4,000	35	10	25	75	Poor	Good	2	..	C	Cent. sta.	..	1
30	30,000	1,250	250	1,000	900	Fair	Good	..	..	C B	Cent. sta. Spl. dealer	5 ..	1
31	3,500	55	30	25	100	Very poor	Owns ice pl.	1	..	B	Spl. dealer	..	2
32	20,000	375	100	275	400	Conservative	Fair	..	..	C	Cent. sta.	3	1
33	3,000	210	35	175	150	Very enthus.	Poor	1	..	B-C feat. "B"	Cent. sta.	6	5
34	11,000	250	50	200	250	Favorable	Good	3	..	C	Cent. sta.	1	1
35	800	35	10	25	75	Good	Fair	1	2	B	Cent. sta.	2	
36	5,500	225	150	75	100	Fair	Good	..	..	B	Cent. sta.	..	

geration Survey

even more rapidly than in the past year and afford constructive information of great value. The tables are made by dividing the United States into four sections: East, South, Middle West and West. Each section is treated in three pages with the top columns differing on each page but with the side or left-hand column of localities common to each sheet.

mber n les aff	Time in Refrigerator Business		Number Units Sold, Jan. 1–Aug. 15, 1926			Sales Estimate for 1927		Selling Method Used			Sales Plan			Special Training for Salesmen
	Years	Mos.	Commercial	Domestic	Per Cent Remote	Commercial	Domestic	Resale Plan	Special Men	General Sales Force	Continuous	Continuous and Campaign	Seasonal	
1	1	8	70	350	60	300	1,200		Yes		Yes			1 month
							2,700		Yes		Yes			
4	2				50					Yes	Yes			2 weeks
1				2	100		50			Yes	Yes			
			1	15		15	75			Yes	Yes			
4	1		40	50	60	100	300		Yes			Yes		3 weeks
5				300			2,000		Yes			Yes		Factory schools
8			350	675	60		1,900		Yes			Yes		1 month
		2		150	50		750		Yes			Yes		3 weeks
		8		80			500		Yes			Yes		1 month
		8		6			100			Yes	Yes			
		2		9						Yes	Yes			
		7		27					Yes		Yes			
3	1	8	10	40			100			Yes		Yes		3 weeks
		8		14			50			Yes	Yes			3 weeks
		3							Yes		Yes			
4	1	8		60			150			Yes	Yes			Local sales schools
				38			125			Yes	Yes			Sales schools
1		4		1			50		Yes		Yes			3 weeks
	1	8		300			500			Yes	Yes			Sales schools
			25	125		100	400		Yes		Yes			Sales schools
3			50	350	25	75	425		Yes			Yes		3 weeks
			50	350		100	500		Yes			Yes		3 weeks
				14			50			Yes				
5		8		25		25	175			Yes	Yes			Sales schools
			20	83		75	200		Yes		Yes			Sales schools
		4		7						Yes	Yes			
		5	2	6		25	50			Yes	Yes			
		2		6			100			Yes	Yes			Sales schools
		3		5						Yes	Yes			No
		5		11			200		Yes		Yes			
1	1			5			250		Yes			Yes		Factory sales schools.
			50	85		150	300		Yes		Yes			1 month
		3		4			50			Yes	Yes			Yes
			45	50		150	300			Yes	Yes			
	1	8		7			50			Yes	Yes			
		3		3			40			Yes				
		1												
part				28			150		Yes	Yes	Yes	Campaign poor shi	cancelled pments	3 weeks
	1									Yes	Yes			3 weeks
		6		20			50			Yes	Yes			
										Yes	Yes			Sales schools
9										Yes	Yes			Sales schools
			4	12			75			Yes	Yes			3 weeks
		5		35						Yes	Yes			
		4		23			150		Yes		Yes			Sales schools
		2		4		In 1927*	400			Yes	Yes			
		2		10			125			Yes	Yes			
	2			12			50			Yes	Yes			
										Yes		Yes		2 weeks
	1	8	14	70			200		Yes		Yes			2 weeks
		3		25			100		Yes		Yes			
2	1	8		50	50	25	125		Yes			Yes		2 weeks
				75			250		Yes		Yes			2 weeks
		8		15			50			Yes	Yes			
		5		10			50			Yes	Yes			
5			40	200	50	100	500			Yes	Yes			Factory 2 weeks
8	4		125	225	50	250	500		Yes			Yes		2 weeks
		3		4			50			Yes	Yes			
				75						Yes	Yes			
		6		15						Yes	Yes			
		2		3										
6			100	383	60	200	750		Yes			Yes		Factory 2 weeks
4		4		45			200		Yes		Yes			Sales schools
		1		4			50			Yes	Yes			
		1												
		1												
	2			12	50		50			Yes	Yes			Sales schools
	1	6		2			50			Yes	Yes			
		1		2			25			Yes	Yes			Factory training
		6	4	24			100			Yes	Yes			
	2			2			25							
		6	20	20	40	25	50			Yes	Yes			
		2		3			50			Yes	Yes			
5				16			50			Yes		Yes		Sales schools
			14	31		50	200			Yes	Yes			
		5		10						Yes	Yes			
		10		3										
6		1							One	Yes	Yes			Sales schools
4	2		17	55						Yes	Yes			Sales schools
1				10										
1		6		1			10			Yes	Yes			
4	2	8	4	20	10					Yes	Yes			Local sales schools
3	2		15	10						Yes	Yes			
0	1		40	100						Yes		Yes		Factory 2 weeks
		8		3						Yes	Yes			Sales schools
	3		30	100	25					Yes	Yes			2 weeks
		2												
	1	6		18						Yes	Yes			Sales schools
5	1	8		122	20	100	300		Yes			Yes		Local sales schools
			100	500	50					Yes	Yes			2 weeks
	2		15	20						Yes	Yes			2 weeks
3	1	4		50			100		Yes			Yes		Local sales schools
6	5		25	125	5					Yes		Yes		Local sales schools
1	1	5		125	12				Yes		Yes	Yes		
2		5	7	16	10	10	65			Yes	Yes			Distrib's schools
		3	0	10				Yes		Yes	Yes			

Southern States Continued on Pages 2 and 3

Compensation of Salesmen		Dealings with User of Refrigerator				Financing Time Payments	
Method	Commission Per Cent	Installation Charge	Length of Time Payment, Months	Discount for Cash	Free Service Period	Local	Manufacturer
Commission	15%	$40	12–24	5%	1 year	Yes	
			12		1 year		Yes
Commission			18	5%	1 year	Yes	
			12	5%	1 year	Yes	
			20		1 year		Yes
			21		1 year	Yes	
Commission			15–24		1 year	Yes	
Commission			12–24		1 year		Yes
Commission			12–24		1 year	Yes	
			12–24		3 months	Self & central sta.	
			10–12		1 year	Yes	
			12–24		1 year	Local	
			24			Local	
Commission			24		1 year	Yes	
			24				Distrib.
			12–24			Local	
			12–18–24			Local bank	
		None	20			Yes	
			12–18–24		1 year		Yes
			12			Yes	
			20		Continuous	Local	
			24		1 year		Mfr.
		$25	10—24		Continuous	Yes	
		25	18–24		Continuous		Mfr.
			12			Local	
			12–24				Distrib.
			12–24		1 year		Mfr.
			12–24				Distrib.
			12–24				Mfr.
			⅓/12–18–24		⅓ year	Finance corp.	
			12		1 year	Self	
		$25	12		1 year	Self	
		37.50	12–24		1 year		Yes
			⅓/10		1 year	Self	
			12–24				Mfr.
			Cash only				
			⅓/12			Self	
			10–12		1 year	Yes	
			12–18		1 year		Yes
			⅓/12			Finance corp.	
			12		1 year	Local	
Commission			12–18		1 year	Self	
			12		1 year	Local bank	
Commission			⅓/12		1 year		Yes
			12		1 year	Local	
			⅓/12		1 year	Commercial Cr.co.	
			12–24		1 year		Yes
Commission			12			Local	
Commission					1 year	Yes	
			12		1 year		Yes
Commission			Cash only				
Commission	8.75–7%		24–30		2 years	Local	
			12–18–24		1 year	Self	
			12–18–24		1 year		
			⅓/12		1 year	Self	
Commission			12–18		1 year		Mfr.
Commission			12–18		1 year		Mfr.
Commission		$25–50	19	6%		Local	
			12–18			Self	
					1 year	Local	
			30–60 days				
			⅓/12			Local	
Commission		$25–40	⅓/12–18–24		1 year	Local	
Commission			10%/24			Finance corp.	
			⅓/12			Self	
			10%/18	5%			
			¼/10			Local	
		$40–50	12–18–24		1 year		Mfr.
		$40	¼/12			Self	
Commission		+Frt.+dray $35-60	$20–15		1 year	Self	
Commission		+Frt.+dray $40-70	¼/12		1 year		Mfr.
			6–8–12		1 year	Local	
Commission	10%				1 year	Local	
Commission			20%/12		1 year		Mfr.
Commission			25%/10			Local	
Commission	$40–10%		18		1 year	Local	
Commission	10%				1 year		Mfr.
Commission			12–18		1 year		Mfr.
	$75–10%		12–18		1 year	Local	
Commission			12–18				Mfr.
Commission		$45 remote	10	6%	1 year	Local	
Commission	10%	$12	12–18–24	5%	1 year	Local	
Commission	10%		12–18		1 year		Mfr.
Commission					1 year		Mfr.
Commission	10%	$20	10%/24		1 year	Local	
salary+$125+per cent of rev.inc.	25%	$25	30	Old box trade ins	1 year	Local	
Commission	8%	$20 on remote	12–18–24	5%	1 year	Local	
		$10	20%–12		1 year	Local	
Salary			25%/12–18			Local	

ments	Sales Resistances Encountered			Relations Among Local Outfits			Servicing Method			
Manu-facturer	First Cost	Anticipation of Price Reduction	Unconvinced of Final Development	Price-Cutting Claims	Unethical Sales Methods	Central-Station Unfair	Number of Men	Manufacturer's Branch	Own Force	Special Training for Service Men
	Yes	Yes		No		No	7		Yes	1 month
Yes	Yes			No	No	No			Yes	1 month
	Yes			No	No		4		Yes	5 weeks
	Yes			Yes	No	Yes	1		Yes	
Yes	Yes			No	No	No	1		Yes	
	Yes		Yes	No			2		Yes	1 month
	Yes			No	Yes		4	"B" only	Yes	Factory schools
Yes				No	No	No	9		Yes	1 month
				No	No	No	3		Yes	1 month
				No	No	No			Yes	Factory and field, 3
						No			Yes	
						No	1		Yes	1 month
						No	1		Yes	2 weeks
	Yes			Yes	No		1		Yes	Factory and field
Distrib.				Yes	No	No	1		Yes	Factory or factory sch
				Yes	No	No	1		Yes	1 month
				Cuts prices	Yes	No	2		Yes	1 month
				No	No	No	2		Yes	1 month
Yes				No	No	No	1		Yes	1 month
				No	No	No	1		Yes	Factory rep. school
				No	No		3		Yes	3 weeks
Mfr.				No	No	No			Yes	Factory trained
	Yes			No	No		3	Yes		
Mfr.						No co-operation	2		Yes	Factory and field
				No	No	No co-operation	2		Yes	
Distrib.	Yes		Cost of operation	No	No			Yes		
Mfr.				No	No	No	6		Yes	School and field
Distrib.						No		Yes		
Mfr.						No		Yes		
						No	1		Yes	School and field
						No	2		Yes	
						No	1		Yes	
	Yes			No	No		1		Yes	
Yes				No	No	No	4		Yes	Service school training
				No	No		1		Yes	
Mfr.	Yes			No	No	Very fair	1		Yes	2 weeks
				No	No		1		Yes	
	Yes		Yes	No	No	No	1		Yes	
	Yes			No	No		1		Yes	
Yes	Yes			No	No	No	6		Yes	2 wk. factory, 4 mo. fi
				No	No	No	1		Yes	
	Yes	Yes		No	No	No			Yes	1 month
	Yes			No	Yes		1	Yes		
Yes				No	Yes	Yes			Yes	
				No	Yes	Yes			Yes	
				No					Yes	
	Yes			No	No	No			Yes	3 weeks at factory
Yes	Yes		Yes	No	No	No			Yes	Factory training
				No	No	Very fair	1		Yes	
	Yes			No	No				Yes	
Yes				No	Yes	Yes			Yes	2 weeks
	Yes			No			1		Yes	2 weeks
	Yes			No	Yes		1		Yes	2 weeks
				No	Yes	Yes	6		Yes	2 weeks
				No	Yes		1		Yes	At factory
	Yes			No	Yes	Yes	1		Yes	
Mfr.	Yes			No	No	Yes	6		Yes	Factory 2 weeks
	Yes			No	No		5		Yes	Factory
				No	Yes	Yes				
	Yes			No	Yes	Yes	Yes		Yes	
				No	No	Yes			Yes	
	Yes			No			5		Yes	Factory 2 weeks
	Yes				Yes	Yes	2		Yes	Factory training
							1		Yes	
				No	No		1		Yes	Factory trained
				No	No	High rates	1		Yes	
				No	No	High rates	1		Yes	
				No	No	*	2		Yes	Factory
Mfr.	Yes			No	No	No	2		Yes	Factory trained
							1		Yes	2 weeks
	Yes			Yes	No		2	One	One	Special school
Mfr.				Yes	Yes	Yes			Yes	Special school
	Yes		Yes				1		Yes	
			No pioneering				1		Yes	Special school
Mfr.			No pioneering	No	No		2		Yes	1 month
	Yes	Yes	Yes				None			
	Yes			No	No		1		Yes	Service manuals
Mfr.	Yes						2		Yes	
Mfr.	Yes		Yes			Yes			Yes	Factory month
	Yes								Yes	
Mfr.	Yes	Yes	Yes						Yes	1 month
	Yes	Yes	Yes				1		Yes	1 month
	Yes	Yes	Yes	No	Yes		3		Yes	At factory month
Mfr.	Yes	Yes	Yes	Yes	Yes				Yes	At factory month
Mfr.	Yes	Yes	Yes			Yes			Yes	
	Yes		Yes				2		Yes	1 month
	Yes			No	No		3		Yes	
	Yes	Yes	Yes				2		Yes	Special school
	Yes	Yes	Yes				1		Yes	Distrib. school
			Yes					Yes		

* Central station does not merchandise. No co-operation.

Southern States Continued on Page 3

Servicing Experience of Each Outlet					Manufacturer's Service on Repair	Type of Unit Advocated for Home		Kw.-Hr. per Unit per Year	Satisfaction of Each with Refrigerat	
Yearly Cost per Unit	Number Service Calls per Year	Frequency of Periodic Inspection	Ease of Repair	Complaints		Remote	Self-Contained		Mechanical Construction	Quality in Manufacture
$15	3	90 days	Good	Leaks, adjustments	Good	Yes		806	Good	Good
			Good			Yes		870	Good	Good
		No	Fair	Leaks, odors, cabinets, adjustments	Fair	Yes		900	Fair	Fair
15		No	Fair			Yes			Good	Good
					Good	Yes			Good	Good
			Good	Odors, noise, leaks	Good	Yes		1000	Fair	Fair
	1		Good	Adjustments	Good	Yes		800	Good	Good
			Good		Good	Yes			Good	Good
			Fair		Fair	Yes			Fair	Good
			Good							
						Yes				
		In favor		With "C" leaks	Fair	Yes			Good	Good
					Fair	Yes				
				Expansion valve, leaks, belt	Fair	Yes			Good	Fair
			Good		Good	Yes			Good	Good
				Belt, pulley, expansion valves	Good	Yes			Good	Good
	1.8		Good	Machines, very satisfactory	Good	Yes			Good	Good
					Good	Yes			Good	Good
									Good	Good
				Machines, very satisfactory			Yes		Good	Good
					Good				Good	Good
						Yes				
						Yes				
				Belt trouble	Good	Yes		878	Good	Good
					Good	Yes			Good	Good
		In favor				Yes				
								704	Good	Good
									Good	Good
				Very little service		Yes		840	Good	Good
					Good	Yes			Good	Good
						Yes				
						Yes			Good	Good
				Leaks, odors, warping doors	Good	Yes			Fair	Fair
									Good	Good
						Yes			Good	Good
						Yes			Good	Good
					Fair	Yes			Good	Good
						Yes			Good	Good
									Good	Good
						Yes		720		
									Good	Good
									Good	Good
$10	2.7	One per mo. first 6 mo	Fair	Leaks, defrosting, belts	Good	Yes		800	Fair	Fair
						Yes			Good	Good
									Good	Good
									Good	Good
		All installs. checked		Noise, needed oil, minor adjustments	Good	Yes		850	Good	Good
									Good	Good
					Fair	Yes			Good	Good
$10	3	All installs. checked			Good	Yes			Good	Good
					Good	Yes			Good	Good
		Monthly		Very little trouble	Good		Yes	650		
				Very little trouble				950	Good	Good
									Good	Good
									Good	Good
									Good	Good
									Fair	Fair
									Good	Good
									Good	Good
Negligible		Quarterly	Fair	Leaks, float valves	Good	Yes		900	Fair	Fair
				Very few troubles	Good	Yes			Good	Good
					Good	Yes				
						Yes			Good	Good
					Very good				Good	Good
				Leaks			Yes			
				Expansion valves		Yes			Good	Good
					Good	Yes			Good	Good
									Good	Good
							Yes		Perfect	Good
						Yes			Good	Good
20% list				Leaks	Fair		Yes	870	Fair	Poor
		Yes	Fair	Operation not up to par	Fair		Yes		Fair	Fair
					Good			850	Good	Good
						Yes		900	Good	Good
	7		Fair	Leaks, belt, float fuse, odor	Good	Yes	Most instl.		Fair	Poor
		Yes		B satisfactory, C = leaks, odor		Yes				
	1	Checked after install.		Leaks, floats, need defrosting	Fair	Yes			Fair	Fair
$20				Very little trouble	Good		Yes	1,000	Good	Good
					Good		Yes	1,000	Good	Good

[1]"B" with small electric dealer. [2]Other small dealers inactive. [3]Central station does not merchandise. [4]"B" most act

on of Each Selling Outlet Refrigerator Handled			Manufacturer's Dealings with Each Outlet Discount Allowed Per Cent	Relations of Retail Outlet with Refrigeration Manufacturer								Survey Reporter's Impression of Local Outlet Organization
ality in nufac-ture	Operating Performance	Selling Features		Discount	Delivery of Units	Delivery of Repairs	Sales Assistance	Advertising Assistance	Installation and Service	Billing Methods	Handling Time Payments	
Good	Good	Good	30	Good	Good	Good	Good	Good	Fair	Good	.....	Good
Good	Good	Good	.....	Good	Fair	Fair	Good	Good	Fair	Good	Good	.....
Fair	Fair	Good	.....	Fair	Fair	Fair	Fair	Fair	Fair	Fair	.....	Poor
Good	.....	.....	.....	.....	.....	.....	Fair	Fair	Fair	.....	.....	Fair
Good	Good	Good	.....	.....	.....	.....	Good	Good	Good	.....	.....	Fair
Fair	Good	Good	.....	Fair	Fair	Fair	Good	Good	Fair	.....	.....	Fair
Good	Good	Good	.....	Fair	Fair	Fair	Good	Good	Good	Fair	Good	Good
Good	Good	Fair	.....	Fair	Fair	Fair	Fair	Fair	Good	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	.....	Fair	Fair	Fair	Fair	Fair	Fair	.....	.....	Poor
				Good			Fair	Fair				Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Poor
Fair	Good	Good	.....	Good	Slow	Fair	Fair	Fair	Fair	.....	.....	Fair
Good	Good	Good	.....	.....	.....	.....	Good	Good	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	.....	Good	Fair	Fair	Fair	Fair	Fair	Good	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	22	Fair	Good	Good	Good	Good	Good	.....	.....	Good
Good	Good	Good	.....	.....	Good	Good	Good	Good	Good	.....	.....	Good
Good	Good	Good	.....	.....	Fair	Fair	Fair	Fair	.....	.....	.....	Fair
Good	Good	Good	.....	Good	Good	Good	Good	Good	Good	.....	.....	Fair
Good	Good	Good	.....	Good	Good	Good	Good	Good	.....	.....	.....	Good
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
Good	Good	Good	.....	Fair	Fair	Fair	Fair	Fair	Fair	.....	.....	Fair
Good	Good	Good	.....	Fair	Good	Good	Good	Good	Good	.....	.....	Fair
.....	.....	.....	.....	Good	.....	.....	Fair	Fair	Fair	.....	.....	Fair
Good	Good	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	.....	Fair	.....	.....	.....	.....	.....	.....	.....	Poor
Fair	Fair	Fair	42	Good	Fair	Fair	Fair	Fair	Fair	Fair	.....	Fair
Good	Good	Good	.....	Fair	Fair	.....	Fair	Fair	.....	.....	.....	Fair
Good	Good	Good	.....	Fair	Fair	Fair	Good	Good	Good	.....	.....	Fair
Good	Good	Fair	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
Good	Good	Good	.....	Fair	Good	Good	Fair	Fair	.....	.....	.....	Fair
Good	Good	Good	.....	Fair	Fair	Fair	Good	Good	.....	.....	.....	Fair
Good	Good	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....	Fair	Fair	.....	.....	.....	Fair
Good	Good	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	.....	Fair	.....	.....	.....	.....	.....	.....	.....	Poor
Fair	Fair	Good	42	Fair	Fair	Fair	Fair	Fair	Good	.....	.....	Fair
Good	Good	.....	.....	Fair	Good	Good	.....	.....	.....	.....	.....	Good
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	.....	Fair	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	.....	Fair	.....	.....	.....	.....	.....	.....	.....	Good
Good	Good	Good	.....	Good	Good	Good	Good	Good	Good	Good	.....	Very good
Good	Good	Poor	.....	.....	.....	.....	.....	.....	.....	.....	.....	Poor
Good	Good	Good	.....	Fair	Good	Good	Fair	Fair	Good	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	35	Good	Good	Good	Good	Good	Good	.....	.....	Good
Good	Good	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Poor
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
Good	Good	Good	42	Good	.....	.....	Fair	Fair	Good	.....	.....	.....
Good	Good	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	.....	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	25	Fair	.....	.....	.....	Good	.....	.....	.....	Fair
Fair	Fair	Fair	.....	Good	.....	.....	.....	Fair	.....	.....	.....	Poor
Good	Good	Good	.....	Fair	Good	Good	Good	Good	Good	.....	.....	Fair
Good	Good	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	Fair
Fair	Fair	Fair	42	Good	Fair	Fair	Fair	Fair	Good	.....	.....	Fair
Good	Good	Good	.....	Fair	Good	Good	Good	Good	Good	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	Fair	Fair	.....	.....	Poor
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Good	Good	Good	42	Good	.....	.....	.....	.....	.....	.....	.....	Poor
Good	Good	Good	.....	Fair	Good	Good	Good	Good	Good	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	42	Good	.....	.....	Poor	Poor	Fair	.....	.....	Poor
Good	Good	Good	.....	.....	.....	.....	Fair	Fair	Fair	.....	.....	Poor
Good	Good	Good	.....	Fair	Fair	Fair	Good	Good	.....	.....	.....	Fair
Good	Good	Good	.....	.....	.....	.....	Good	Good	.....	.....	.....	Good
Good	Good	Fair	35	Good	Poor	.....	Fair	Fair	.....	.....	.....	Fair
Good	Good	Good	.....	Good	Good	Good	Good	Good	.....	.....	.....	Fair
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Poor	Poor	Fair	42	Good	Poor	Poor	Poor	Poor	Poor	.....	.....	Poor[1]
Fair	Poor	Good	42	Good	Fair	Fair	Fair	Good	Good	.....	.....	Good
Good	Good	Good	.....	Fair	Good	Good	Good	Good	.....	.....	.....	Good[2]
Good	Good	Good	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Poor	Fair	Good	42	Good	Fair	Fair	Good	Fair	Good	.....	.....	Fair
.....	.....	.....	.....	Fair	Good	Good	Fair	Good	.....	.....	.....	Good
Fair	Fair	Good	42	Good	Good	Fair	Fair	Fair	Fair	.....	.....	Poor
Good	Good	Good	30	Good	Good	Good	Fair	Very good	Fair	.....	.....	Fair
Good	Good	Good	30	Good	Good	Good	Good	Good	Good	Good	.....	Poor[3]

[1] "B" most active distributor. [2] "A" and "B" dealers inactive. [3] "B" distributor also retails in this town.

Locality	Approximate Number of Domestic Customers	Number of Electric Refrigerators				Central-Station Executive Reaction to Electric Refrigeration	Relations With Ice Industry	Total Number Electric Refrigerator Selling Outlets	Total Number Electric Refrigerator Salesmen	Local Selling Ou	
		On Lines	Commercial	Domestic	Total Estimated Sales For 1927					Make	Type of Dealer
1	100,000	1,800	200	1,600	2,175	Good	Turbulent	6	38	A B D-F-H G	Cent. sta. Dist. dealer Misc. dealers Spl. dealer
2	1,000	50	...	50	50	Good	Good	2	1	J B	Cent. sta. Elect. dealer
3	12,000	100	20	80	220	Good	Good	2	4	C B	Cent. sta. Spl. dealer
4	6,000	60	...	60	80	Good	Good	2	3	J	Cent. sta.
5	4,000	76	5	71	185	Good	Good	3	6	J & L A B	Cent. sta. Elect. dealer Elect. dealer
6	3,000	57	...	57	100	Good	Quiet	3	3	A B G	Cent. sta. Elect. dealer Elect. dealer
7	13,000	550	150	400	425	Good	Good	1	4	B & L	Cent. sta.
8	4,000	24	...	24	100	Good	Good	2	2	A B	Cent. sta. Cont. dealer
9	7,500	22	...	22	90	Neutral	Neutral	4	1	A B T & J	Cent. sta. Oil htg. El. dealer hdw. store
10	12,000	230	52	178	550	Neutral	Unsettled	4	3	A C B Q	Cent. sta. Cent. sta. Hdw. store Plumber
11	15,000	595	255	340	1,025	Good	Good	3	13	C A B	Cent. sta. Dist. dealer Dist. dealer
12	1,400	24	4	20	75	.....	.....	2	..	B A	Elect. dealer Elect. dealer
13	7,500	400	50	350	325	Neutral	Good	3	5	C-D B A	Cent. sta. Spl. dealer Elect. dealer
14	10,000	308	25	283	295	Favorable	Neutral	2	5	A B	Cent. sta. Elect. dealer
15	150,000	1,447	300	1,147	2,750	Favorable	Good	5	58	A B G C F	Cent. sta. Dist. dealer Dist. dealer Dept. store Plumbing-htg.
16	3,500	51	24	27	240	Favorable	Good	3	..	C B F	Cent. sta. Elect. dealer Elect. dealer
17	2,000	26	6	20	75	Favorable	Good	1	1	B	Elect. dealer
18	120,000	974	75	899	2,150	Favorable	Good	3	24	A B C	Cent. sta. Dist. dealer Dept. store
19	180,000	1,350	300	1,050	2,800	Favorable	Good	3	20	A B & C	Cent. sta. Spl. dealers
20	4,500	8	...	8	25	Favorable	Neutral	..	1	C	Cent. sta.
21	5,000	91	10	81	200	Favorable	Good	1	1	B	Cent. sta.
22	5,000	26	...	26	70	Favorable	Neutral	3	1	C B F	Cent. sta. Elect. dealer Agent
23	4,000	300	25	275	275	Favorable	Good	2	..	B A	Elect. dealer Hse. frng
24	4,200	30	3	27	110	Favorable	Good	2	..	A B	Cent. sta. Elect. dealer
25	12,000	150	10	140	255	Favorable	Good	5	3	C B A-D-G	Cent. sta. Spl. dealer Misc. dealers
26	14,000	150	...	150	250	Favorable	Neutral	3	2	B	Cent. sta.
27	5,000	15	...	15	50	Favorable	Neutral	..	1	B	Cent. sta.
28	5,000	24	4	20	50	Neutral	Quiet	..	..	C B	Cent. sta. Elect. dealer
29	14,000	400	60	340	475	Favorable	Good	2	8	C B	Cent. sta. Dist. dealer
30	18,000	200	25	275	640	Favorable	Good	..	..	A B	Spl. dealer Spl. dealer
31	3,000	10	...	10	30	Favorable	Good	1	..	A	Cent. sta.
32	85,000	775	100	675	1,345	Good	Good	5	17	C & D A C M B	Cent. sta. Cent. sta. Cent. sta. Dist. dealer Dist. dealer
33	6,500	50	...	50	30	Good	Good	1	1	A	Cent. sta.
34	8,000	75	...	75	235	Good	Good	3	2	C A F	Cent. sta. Elect. dealer Spl. dealer
35	5,000	110	15	95	185	Favorable	Unsettled	2	3	A B	Cent. sta. Spl. dealer
36	12,000	54	4	50	50	Neutral	Good	2	2	C A	Cent. sta. Spl. dealer
37	8,000	35	...	35	150	Favorable	Good	2	1	C B	Cent. sta. Elect. dealer
38	3,500	11	...	11	20	Good	Neutral	..	1	A	Cent. sta.
39	5,000	51	16	35	155	Good	Good	2	1	A B	Cent. sta. Elect. dealer
40	7,500	300	60	240	700	Good	Good	1	5	B	Cent. Sta
41	9,000	120	18	102	400	Good	Good	2	1	A B	Cent. sta. Spl. dealer
42	30,000	505	40	465	1,200	Fair	Neutral	3	11	C A B	Cent. sta. Spl. dealer Dist. dealer
43	48,000	600	40	560	750	Favorable	Good	2	14	A B	Cent. sta. Dist. dealer
44	4,000	50	8	42	95	Favorable	Good	3	5	B A F	Cent. sta. Hdw. dealer Hdw. dealer
45	12,000	111	15	96	225	Favorable	Good	3	7	C B A	Cent. sta. Elect. dealer Hdw. and htg.
46	45,000	505	55	450	725	Favorable	Good	3	7	C B A A	Cent. sta. Dist. dealer Oil htg. Dept. store
47	3,000	20	...	20	100	Favorable	Neutral	3	1	A B F	Elect. dealer Elect. dealer Spl. dealer
48	45,000	511	27	484	585	Favorable	Quiet	5	7	C B A F N	Cent. sta. Spl. dealer Dept. store Ice mfgr. Spl. dealer
49	250,000	15,000	5,000	10,000	13,500	Favorable	Neutral	8	100	A & C A A B F C N 1-A	Cent. sta. Oil htg. Dist. dealer Dist. dealer Spl. dealer Dist. dealer Dist. dealer Spl. dealer
50	230,000	3,500	800	2,700	5,800	Favorable	Good	5	54	A C B D F	Dist. dealer Dist. dealer Dist. dealer Spl. dealer Spl. dealer
51	62,000	2,424	664	1,760	3,200	Favorable	Good	1	11	B C	Cent. sta. Same co.
52	80,000	3,000	1,200	1,800	2,900	Favorable	Neutral	6	25	C B A D-F-G	Cent. sta. Spl. dealer Spl. dealer Elect. dealers

Selling Outlets				Number Units Sold, Jan. 1–Aug. 15, 1926			Sales Estimate for 1927		Selling Method Used			Sales Plan			Special Training for Salesmen
e of ler	Number in Sales Staff	Time in Refrigerator Business		Commercial	Domestic	Per Cent Remote	Commercial	Domestic	Resale Plan	Special Men	General Sales Force	Continuous	Continuous and Campaign	Seasonal	
		Years	Mos.												
sta.	20	3		20	345	85		800	Yes			Yes			2-4 weeks
dealer	15	3		30	330	75	175	1,000		Yes		Yes			2-4 weeks
dealers		1	2		100	15					Yes	Yes			
ealer	3		2		45			200		Yes		Yes			
sta.	1	1			21	50		50			Yes			Yes	
dealer		1			1										
sta.	2	2		10	16	50	20	50		Yes				Yes	
ealer	2	2		12	18	60	25	125		Yes		Yes			2 weeks
sta.	3	2			28	60		80			Yes	Yes			
sta.	4	2		5	28	50	15	75			Yes	Yes			
dealer	1	1			20	40		45			Yes	Yes			
dealer	1	1			23	60		50							
sta.	2	1			16	60		60		Yes				Yes	1 week
dealer	1	1			10	50		40							
dealer		1			1										
sta.	4	5		30	106	75	75	350		Yes		Yes			1 week
sta.	2	2			6	50		50			Yes	Yes			1 week
dealer		1			18	50		40			Yes	Yes			
sta.	1	1			10			50			Yes	Yes			
htg.		1			12	60		40			Yes			Yes	
hdw. store			6												
sta.		1			35	60		75			Yes		Yes		
sta.		2			50	70		150			Yes		Yes		2 weeks
store	3	2		52	93	70	100	225			Yes	Yes			
nber		1													
sta.	3	2		11	200	70	25	325		Yes			Yes		2 weeks
dealer	3	2			100			225		Yes		Yes			2 weeks
dealer	7	2		245	40	60	150	300		Yes		Yes			1 week
dealer			6	20	4		50	25					Yes		
dealer			3										Yes		2 weeks
sta.	1	1			10						Yes			Yes	2 days
ealer	3	2		35	61	75	50	75		Yes			Yes		2 weeks
dealer	1	2			100	60		200			Yes		Yes		2 weeks
sta.	2	2			93	75		175		Yes	Yes		Yes		2 weeks
dealer	3	2		15	125	80	20	100		Yes			Yes		
sta.	15	3			552	60		800		Yes			Yes		2 weeks
dealer	35	2		300	525	70	400	1,200		Yes		Yes			2 weeks
dealer	8		2		30			350		Yes		Yes			1 week
store			2		40						Yes			Yes	
ng-htg.		3													
sta.		1			10	50		150			Yes			Yes	1 week
dealer		1		24	16	60	40	50				Yes			
dealer		1			1										
dealer	1	1		6	20	50		75			Yes	Yes			1 week
sta.	6	3			100	60		350		Yes			Yes		2 weeks
dealer	8	3		75	300	75	300	900		Yes		Yes	Yes		2 weeks
store	10	1			150			500		Yes			Yes		1 week
sta.	8	2			350	80		1,000		Yes		Yes			2 weeks
ealers	12	2			700			1,800							
sta.		1			8			25			Yes			Yes	
sta.	1	1		10	81	75	25	200		Yes		Yes			2 weeks
sta.		1			7			20			Yes			Yes	
dealer	1		6		15			50			Yes			Yes	
ent			6		4										
dealer		3	6		125	60		200			Yes	Yes			
frng		1			40			75			Yes			Yes	
sta.		1			7	40		40			Yes		Yes		
dealer		1			20			75				Yes			
sta.	1	3			40			80			Yes		Yes		
ealer	2	2			100			175	Yes			Yes			2 weeks
lealers															
sta.	3	2		25	150	75	50	250		Yes			Yes		2 weeks
sta.		2			12	15		50			Yes			Yes	
sta.		1			1						Yes				
dealer		1		4	19	50	8	40						Yes	
sta.	3	3			60	40		100		Yes			Yes		2 weeks
lealer	5	2		50	150	70	75	300		Yes		Yes			2 weeks
ealer	5	1			150	90		300		Yes		Yes			2 weeks
ealer	3	1		25	125	75	40	300		Yes					
sta.	1	1			10	25		30			Yes			Yes	2 weeks
sta.	2	3		10	60	30		120		Yes		Yes			2 weeks
sta.	2	2			40			100	Yes	Yes		Yes			2 weeks
sta.	3	2			165	50		200			Yes	Yes			1 week
dealer	4	1			150					Yes		Yes			
dealer	6	2		100	250	75	125	800		Yes		Yes			2 weeks
sta.	1	2			10	50		30			Yes			Yes	1 week
sta.	1	1			10			50		Yes				Yes	1 week
dealer		2			15	50		35			Yes			Yes	
lealer	1	1			50			150		Yes		Yes			1 week
sta.	1	2			10	50		50			Yes			Yes	1 week
lealer	2	3		5	75	80	10	125		Yes		Yes			2 weeks
sta.	1	1		4	10	60				Yes				Yes	1 week
lealer	1	3			40			50		Yes		Yes			
sta.		1			10	50		75			Yes			Yes	1 week
dealer		1			25	60		75			Yes	Yes			
sta.			4		5	60		20			Yes	Yes			
sta.	1	1			35	70		75		Yes		Yes			1 week
dealer		1		16			30	50							
Sta	5	2		50	162	80	100	600		Yes			Yes		1 week
sta.		2			40	60		100			Yes			Yes	
lealer	1	2		18	62	75	40	260		Yes		Yes			1 week
sta.	1	2			20					Yes				Yes	1 week
lealer	2		2		25			300		Yes		Yes			1 week
dealer	8	2		40	400	80	100	800		Yes		Yes			2 weeks
sta.	6	3		3	120	60		350		Yes		Yes			1 week
dealer	8	2			150	80		400		Yes		Yes			1 week
sta.	4		2	6	30	75	15	80			Yes		Yes		1 week
dealer	1		6		1										
dealer			2												
sta.	3	3		6	45	60	10	75		Yes			Yes		2 weeks
dealer	3	1		9	50	75	15	125		Yes		Yes			1 week
nd htg.	1		3		1					Yes		Yes			1 week
sta.	3	3		10	165	70	15	200		Yes			Yes		1 week
dealer	3	2		45	250	80	60	450		Yes		Yes			1 week
htg.	1	1			35					Yes		Yes			2 weeks
store			6		1						Yes	Yes			
dealer		1			2			30			Yes				
dealer		1			7			20						Yes	
lealer	1		2		11			50		Yes		Yes			
sta.	3	3		2	175	70	10	250		Yes			Yes		1 week
lealer	4	2		15	160	80	25	300		Yes		Yes			1 week
store		1			19						Yes			Yes	
nfgr.			6		10										
lealer			6		30							Yes			
sta.		2			300	60		500			Yes				
htg.		1			30						Yes			Yes	
dealer	25 to 35	3		300	900	75	1,500	2,000	Yes	Yes		Yes			2 weeks
dealer	30–45	5		600	1,600	80	1,000	2,500		Yes		Yes			2 weeks
dealer	15–25		2		60	50		2,000		Yes		Yes			2 weeks
dealer	12–24		6		1,000	50		2,000		Yes		Yes			2 weeks
dealer	8	3			700	50		1,500		Yes		Yes			2 weeks
dealer	2	2			150	50		500		Yes		Yes			2 weeks
dealer	15	3			750	75		1,200		Yes		Yes			2 weeks
dealer	10–18	2		150	500	60	500	1,200		Yes		Yes			2 weeks
dealer	15	3		300	900	80	400	1,800		Yes		Yes			2 weeks
dealer	2		6		50			200		Yes		Yes			2 weeks
dealer	4		6		200			500		Yes		Yes			
sta.	10	2		444	1,206	80	700	2,500		Yes	Yes		Yes		2 weeks
e co.	1	2		120	110					Yes	Yes		Yes		2 weeks
sta.	9	5			500	50		900		Yes		Yes			1 week
dealer	10	3		300	700	70		1,200		Yes		Yes			2 weeks
dealer	6	2			450	60		800		Yes		Yes			
dealers		1			200										

Middle-Western States Continued on Pages 5 and 6

Compensation of Salesmen		Dealings with User of Refrigerator				Financing Time Payments		Sales
Method	Commission Per Cent	Installation Charge	Length of Time Payment, Months	Discount for Cash	Free Service Period	Local	Manufacturer	First Cost
Commission		$35	24		1 year	Yes		
Commission		$25	24		1 year		Yes	
Commission						Yes		
Salary and commission	$75+8%		18		1 year	Yes		Yes
Salary and commission	$75—7½%		18		1 year	Yes		
Commission	10		12–24		1 year		Yes	
Salary and commission	$75+8%		18		1 year	Yes		Yes
Salary and commission	$50+8%		12–18		1 year	Yes		Yes
Commission	10		12		1 year	Yes		
Commission	10	15	18		1 year	Yes		Yes
Salary and commission	$150+2%		18		1 year	Yes		Yes
			10		1 year	Yes		Yes
			Cash					Yes
			12–24		1 year	Yes		
			12			Yes		
			12		1 year	Yes		Yes
Salary and commission			18		1 year	Yes		Yes
Commission		Estimated	12		1 year	Yes		Yes
Salary and commission			18		1 year	Yes		Yes
Commission	10		12–18		1 year	Yes		Yes
Commission			12		1 year		Yes	Yes
					1 year			Yes
								Yes
			20		1 year	Yes		Yes
		$35	12		1 year		Yes	Yes
			Cash		3 months			Yes
			17		1 year	Yes		Yes
		Estimated	12		1 year		Yes	Yes
			12		1 year	Yes		Yes
Commission			12		1 year		Yes	Yes
Commission			12		1 year	Yes		Yes
			12		1 year	Yes		Yes
			12		1 year		Yes	
			12		1 year			Yes
			12		1 year		Yes	
			12		1 year			
Commission	15	$35–60	14		1 year	Yes		Yes
Commission	10		12		1 year		Yes	Yes
			12		1 year	Yes		
Commission	15	$45	6–18		3 months, 1 year	Yes		Yes
			12	5%	1 year	Yes		Yes
Salary and Commission	$160+2½%		12		1 year	Yes		Yes
			12		1 year	Yes		Yes
		$25	12		1 year	Yes		Yes
			12	Yes	1 year	Yes		Yes
			12		3 months	Yes		Yes
		$25	12		1 year	Yes		Yes
			12		1 year	Yes		Yes
			12	5%	1 year	Yes		Yes
			12		1 year	Yes		Yes
			12–24–36		1 year	Yes		
		$25	12		1 year	Yes		Yes
								Yes
Salary and commission			12–24		1 year	Yes		
Commission			12		1 year	Yes		Yes
Commission			12	Yes	2 months	Yes		Yes
			12		1 year	Yes		
Commission	15		18		1 year	Yes		Yes
			12		1 year			Yes
Salary and commission			18		1 year	Yes		Yes
Commission			12		1 year	Yes		
			12–18		1 year		Yes	
			12		1 year	Yes		Yes
Salary and commission	$90+10%		12		1 year	Yes		Yes
Commission			12		3 months	Yes		Yes
			12			Yes		
Commission			12		1 year	Yes		Yes
			12		1 year		Yes	Yes
Commission			12		1 year	Yes		Yes
			12		3 months	Yes		Yes
Salary and commission			6–18		1 year	Yes		Yes
					1 year			Yes
Salary and commission			12		1 year	Yes		Yes
Salary and commission			12		15 months	Yes		Yes
					1 year			
Salary and commission			24		1 year	Yes		Yes
					1 year			Yes
Commission	15		12		1 year	Yes		Yes
Commission			12		1 year	Yes		Yes
Commission			12		3 months	Yes		Yes
			12		1 year		Yes	Yes
Salary and commission	$150+2%	$35	12–18		1 year	Yes		Yes
Commission	15		12–18		2 years		Yes	Yes
Commission	10	$25	12–24		1 year	Yes		
Commission	10		18		1 year	Yes		Yes
Commission	10		12		1 year		Yes	Yes
Commission	10		12		1 year	Yes		
Commission	10		18		1 year	Yes		Yes
Commission	10		18		1 year		Yes	Yes
			12		3 months	Yes		
			12			Yes		Yes
					3 months			
Commission	10	$15			1 year			
					1 year			
Commission	10		18		1 year	Yes		Yes
Commission	10		12–18		1 year		Yes	Yes
			12		3 months	Yes		Yes
			Cash		1 year			
			12					
Salary			12		1 year	Yes		
Commission			12–24		3 months	Yes		Yes
Commission	10		12–24		1 year		Yes	Yes
Commission	10		15		1 year	Yes		Yes
Commission			12–18		1 year		Yes	Yes
Commission	12 and 13%				1 year		Yes	
Commission	12		15		1 year		Yes	Yes
Commission			12		3 months	Yes		Yes
Commission			12–18		1 year	Yes		Yes
Commission	12		12–24		1 year		Yes	Yes
Commission	10				1 year			Yes
Commission			15		1 year	Yes		Yes
Commission	10	$20	12–24		1 year	Yes		
Commission	10	$20	12–24		1 year	Yes		
Commission	10		18		1 year	Yes		
Commission			12–24		1 year			Yes
			12					

Sales Resistances Encountered			Relations Among Local Outfits			Servicing Method			Special Training for Service Men
First Cost	Anticipation of Price Reduction	Unconvinced of Final Development	Price-Cutting Claims	Unethical Sales Methods	Central-Station Unfair	Number of Men	Manufacturer's Branch	Own Force	
	Yes					1	Yes		
						2	Yes		3 months
Yes						1		Yes	1 day
	Yes	Yes				1		Yes	1 month
	Yes	Yes				1		Yes	3 months
Yes						1		Yes	1 day
Yes						1			½ day
	Yes					1		Yes	2 weeks
Yes	Yes		Yes			1		Yes	1 week
Yes						5		Yes	2–8 weeks
Yes	Yes	Yes							
Yes	Yes	Yes							
	Yes	Yes							
	Yes				Yes				
Yes		Yes				1		Yes	1 month
Yes		Yes				1		Yes	1 month
Yes			Yes		Yes	1		Yes	1 month
					Yes	1		Yes	
Yes						5		Yes	1 month
Yes	Yes					2		Yes	2 months
Yes						2		Yes	2 months
Yes									
Yes	Yes					1		Yes	1 month
Yes	Yes								
Yes	Yes					1		Yes	3 days
Yes	Yes					1		Yes	2 weeks
Yes						2		Yes	2 weeks
Yes	Yes					4		Yes	1 month
Yes	Yes		Yes		Yes	1		Yes	2 months
Yes	Yes	Yes				5		Yes	1–3 months
Yes	Yes		Yes		Yes	4	Yes	Yes	3 months
Yes	Yes	Yes	Yes		Yes	2		Yes	2 weeks
Yes									
Yes	Yes					1		Yes	1 week
Yes						2		Yes	1 month
Yes		Yes				1		Yes	1 week
Yes		Yes				1		Yes	1 month
Yes									
		Yes				1		Yes	1 month
Yes						1		Yes	2 weeks
Yes					No				
		Yes				1		Yes	1 month
Yes					Yes	2		Yes	2 months
Yes		Yes				5		Yes	1 month
		Yes							
Yes		Yes				1		Yes	1 month
Yes	Yes						Yes		
Yes	Yes	Yes				2		Yes	1 month
						2	Yes		
		Yes				2		Yes	2 months
Yes						1		Yes	1 week
Yes						1			1 week
Yes									
						1		Yes	1 week
Yes		Yes				1		Yes	1 week
Yes						1		Yes	1 month
Yes						1		Yes	2 weeks
Yes		Yes				1		Yes	1 week
Yes									
Yes						1		Yes	3 weeks
Yes	Yes					1		Yes	2 weeks
Yes						2		Yes	1 month
Yes		Yes				1		Yes	1 week
Yes		Yes				1		Yes	1 month
Yes		Yes				1		Yes	1 month
Yes						1		Yes	1 week
Yes						1		Yes	1 month
Yes		Yes				3		Yes	2 months
Yes		Yes				1		Yes	2 weeks
Yes		Yes	Yes		Yes	3		Yes	2 months
	Yes					1		Yes	2 weeks
Yes		Yes				1		Yes	1 month
Yes						2		Yes	1 month
	Yes								
Yes		Yes				2		Yes	1 month
Yes						2	Yes	Yes	2 months
	Yes	Yes				1		Yes	2 weeks
Yes	Yes	Yes					Yes		
						1		Yes	
		Yes				1		Yes	
						1		Yes	2 weeks
Yes	Yes	Yes				3		Yes	1 month
Yes			Yes			2		Yes	2 months
Yes		Yes							
		Yes							
							Yes		
			Yes	Yes					
Yes		Yes	Yes	Yes		4		Yes	Factory men
Yes		Yes	Yes	Yes			Yes		
Yes			Yes			2		Yes	1 month
Yes		Yes	Yes	Yes			Yes		
		Yes	Yes				Yes		
Yes							Yes		
Yes		Yes	Yes			5	Yes		
Yes		Yes		Yes			Yes		
Yes		Yes				4			Factory men
Yes			Yes	Yes		1		Yes	
Yes			Yes			1		Yes	2 weeks
	Yes	Yes				9		Yes	1 month
	Yes					1		Yes	1 month
	Yes							Yes	1 month
Yes							Yes		

Middle-Western States Continued on Page 6

Compensation of Salesmen		Dealings with User of Refrigerator				Financing Time Payments		Sales Re	
Method	Commission Per Cent	Installation Charge	Length of Time Payment, Months	Discount for Cash	Free Service Period	Local	Manufacturer	First Cost	R
Commission		$35	24		1 year	Yes			
Commission		$25	24		1 year		Yes		
Commission						Yes			
Salary and commission	$75+8%		18		1 year	Yes		Yes	
Salary and commission	$75—7½%		18		1 year	Yes			
Commission	10		12–24		1 year		Yes		
Salary and commission	$75+8%		18		1 year	Yes		Yes	
Salary and commission	$50+8%		12–18		1 year	Yes		Yes	
Commission	10		12		1 year	Yes			
Commission	10	15	18		1 year	Yes		Yes	
Salary and commission	$150+2%		18		1 year	Yes		Yes	
			10		1 year	Yes		Yes	
			Cash					Yes	
			12–24		1 year	Yes			
			12			Yes			
			12		1 year	Yes		Yes	
Salary and commission			18		1 year	Yes		Yes	
Commission		Estimated	12		1 year	Yes		Yes	
Salary and commission			18		1 year	Yes		Yes	
Commission	10		12–18		1 year	Yes		Yes	
Commission			12		1 year		Yes	Yes	
					1 year			Yes	
								Yes	
			20		1 year	Yes		Yes	
		$35	12		1 year		Yes	Yes	
			Cash		3 months			Yes	
			17		1 year	Yes		Yes	
		Estimated	12		1 year		Yes	Yes	
			12		1 year	Yes		Yes	
Commission			12		1 year		Yes	Yes	
Commission			12		1 year	Yes		Yes	
			12		1 year	Yes		Yes	
			12		1 year		Yes	Yes	
			12		1 year	Yes		Yes	
		$25	12		1 year	Yes		Yes	
			12	Yes	1 year	Yes		Yes	
			12		3 months	Yes		Yes	
		$25	12		1 year	Yes		Yes	
			12		1 year	Yes		Yes	
			12	5%	1 year	Yes		Yes	
			12		1 year	Yes		Yes	
			12–24–36		1 year	Yes			
		$25	12		1 year	Yes		Yes	
								Yes	
Salary and commission			12–24		1 year	Yes			
Commission			12		1 year	Yes		Yes	
Commission			12	Yes	2 months	Yes		Yes	
			12		1 year	Yes			
Commission	15		18		1 year	Yes		Yes	
			12		1 year			Yes	
Salary and commission			18		1 year	Yes		Yes	
			12		1 year	Yes			
Commission			12–18		1 year		Yes		
			12		1 year	Yes		Yes	
Salary and commission	$90+10%		12		1 year	Yes		Yes	
			12		3 months	Yes		Yes	
Commission			12			Yes			
			12		1 year	Yes		Yes	
Commission			12		1 year		Yes	Yes	
			12		1 year	Yes		Yes	
Commission			12		3 months	Yes		Yes	
Salary and commission			6–18		1 year	Yes		Yes	
					1 year			Yes	
Salary and commission			12		1 year	Yes		Yes	
Salary and commission			12		15 months	Yes		Yes	
					1 year				
Salary and commission			24		1 year	Yes		Yes	
					1 year			Yes	
Commission	15		12		1 year	Yes		Yes	
			12		1 year	Yes		Yes	
Commission			12		3 months	Yes		Yes	
Commission			12		1 year		Yes	Yes	
Salary and commission	$150+2%	$35	12–18		1 year	Yes		Yes	
Commission	15		12–18		2 years		Yes	Yes	
Commission	10	$25	12–24		1 year	Yes			
Commission	10		18		1 year	Yes		Yes	
Commission	10		12		1 year		Yes	Yes	
Commission	10		12		1 year	Yes			
Commission	10		18		1 year	Yes		Yes	
Commission	10		18		1 year		Yes	Yes	
			12		3 months	Yes			
			12			Yes		Yes	
					3 months				
Commission	10	$15			1 year				
					1 year				
Commission	10		18		1 year	Yes		Yes	
Commission	10		12–18		1 year		Yes	Yes	
			12		3 months	Yes		Yes	
			Cash		1 year				
			12						
Salary			12		1 year	Yes			
Commission	10		12–24		3 months	Yes		Yes	
Commission	10		12–24		1 year		Yes	Yes	
Commission			15		1 year	Yes		Yes	
Commission	12 and 13%		12–18		1 year		Yes	Yes	
Commission	12				1 year		Yes		
			15		1 year		Yes	Yes	
Commission			12		3 months	Yes		Yes	
Commission			12–18		1 year	Yes		Yes	
Commission	12		12–24		1 year		Yes	Yes	
Commission	10				1 year			Yes	
Commission			15		1 year	Yes		Yes	
Commission	10	$20	12–24		1 year	Yes			
Commission	10	$20	12–24		1 year	Yes			
Commission	10		18		1 year	Yes			
Commission			12–24		1 year			Yes	
			12						

Sales Resistances Encountered			Relations Among Local Outfits			Servicing Method			Special Training for Service Men
First Cost	Anticipation of Price Reduction	Unconvinced of Final Development	Price-Cutting Claims	Unethical Sales Methods	Central-Station Unfair	Number of Men	Manufacturer's Branch	Own Force	
	Yes					1	Yes		
						2	Yes		3 months
Yes						1		Yes	1 day
	Yes	Yes				1		Yes	1 month
	Yes	Yes				1		Yes	3 months
Yes						1		Yes	1 day
Yes						1			½ day
	Yes					1		Yes	2 weeks
Yes	Yes		Yes			1		Yes	1 week
Yes						5		Yes	2–8 weeks
Yes	Yes	Yes							
Yes	Yes	Yes							
	Yes	Yes							
	Yes				Yes				
Yes		Yes				1		Yes	1 month
Yes		Yes				1		Yes	1 month
Yes			Yes		Yes	1		Yes	1 month
					Yes	1		Yes	
Yes						5		Yes	1 month
Yes	Yes					2		Yes	2 months
Yes						2		Yes	2 months
Yes						1		Yes	1 month
Yes	Yes								
Yes	Yes					1		Yes	3 days
Yes	Yes					1		Yes	2 weeks
Yes						2		Yes	2 weeks
Yes	Yes					4		Yes	1 month
Yes	Yes		Yes		Yes	1		Yes	2 months
Yes	Yes	Yes				5		Yes	1–3 months
Yes	Yes		Yes		Yes	4	Yes	Yes	3 months
Yes	Yes	Yes	Yes		Yes	2		Yes	2 weeks
Yes									
Yes	Yes					1		Yes	1 week
						1		Yes	1 week
Yes	Yes		Yes		Yes				
Yes	Yes		Yes						
Yes		Yes				5		Yes	1–3 months
Yes						2		Yes	2 weeks
Yes						2		Yes	1 month
Yes						1		Yes	2 weeks
Yes						1		Yes	1 month
Yes						1		Yes	2 weeks
Yes						1		Yes	1 month
Yes						1		Yes	2 weeks
Yes						2		Yes	1 month
Yes						1		Yes	1 week
Yes			Yes		Yes	1		Yes	1 month
Yes						1		Yes	1 week
Yes						1		Yes	1 month
Yes						3		Yes	2 months
Yes						1		Yes	2 weeks
Yes			Yes		Yes	3		Yes	2 months
	Yes					1		Yes	2 weeks
Yes		Yes				1		Yes	1 month
Yes						2		Yes	1 month
Yes		Yes				2		Yes	1 month
	Yes	Yes				2	Yes	Yes	2 months
Yes	Yes	Yes				1		Yes	2 weeks
							Yes		
						1		Yes	
		Yes				1		Yes	
						1		Yes	2 weeks
Yes	Yes	Yes				3		Yes	1 month
Yes			Yes			2		Yes	2 months
Yes		Yes							
		Yes							
							Yes		
			Yes	Yes					
Yes		Yes	Yes	Yes		4		Yes	Factory men
Yes		Yes	Yes	Yes			Yes		
Yes			Yes			2		Yes	1 month
Yes		Yes	Yes	Yes			Yes		
		Yes	Yes				Yes		
Yes							Yes		
Yes		Yes	Yes			5	Yes		
Yes		Yes		Yes			Yes		
Yes		Yes				4			Factory men
Yes			Yes	Yes		1		Yes	
Yes			Yes			1		Yes	2 weeks
	Yes	Yes				9		Yes	1 month
	Yes					1		Yes	1 month
	Yes							Yes	1 month
Yes							Yes		

Middle-Western States Continued on Page 6

Servicing Experience of Each Outlet					Manufacturer's Service on Repair	Type of Unit Advocated for Home		Kw.-Hr. per Unit per Year	Sa
Yearly Cost per Unit	Number Service Calls per Year	Frequency of Periodic Inspection	Ease of Repair	Complaints		Remote	Self-Contained		Mechani Construc tion
$0.67	1		Good	Reglt. thermo.	Good	Yes		750	Good
			Good		Good	Yes			Good
							Yes		Good
			Good		Good		Yes	750	Good
			Poor	Factory inspection	Poor	Yes		720	Poor
			Good	Float valve	Good	Yes			Good
			Good		Good	Yes		750	Good
			Good	Regulate temperature	Good	Either		750	Good
			Good		Fair	Yes			Good
		1 month	Fair	Exp. valve	Fair	Yes		720	Fair
	2		Good	Exp. valve	Good	Yes		750	Good
			Fair		Poor		Yes	720	Fair
					Good	Yes			Good
			Good		Good	Either	Yes	660	Fair
									Good
	4		Fair		Good	Yes		720	Fair
			Poor	Leak, float, odor	Good	Yes		720	Fair
			Good	Broken belts	Good	Yes			Good
							Yes		
	5		Poor	Float, leaks	Poor	Yes		720	Poor
			Good		Good	Yes			Good
			Good	Float valve	Good	Yes			Good
			Good	Float valve	Fair	Yes			Good
						Yes			Good
	C–5		Poor	Factory Inspection	Fair		Yes	700	C-Fa D-Go
	1	2	Good	Adjustment	Good	Yes			Good
	1		Good	Thermo, belt	Good	Yes			Good
$10	2		Good	Thermo, belt	Good	Yes		500	Good
	1		Good	Float, valve	Good	Yes			Good
$16	3		Fair	Thermo, belt	Poor	Either		840	Fair
			Good	Expansion valve	Good	Yes			Good
			Good	Mercury switch	Good		Yes		Good
				Leaks, factory inspection	Fair		Yes		Fair
			Fair	Leaks		Yes		720	Fair
			Good		Good	Yes			Good
$6.25	1		Fair	Thermo, Expansion valve	Fair	Yes		900	Fair
$1.50–3.00	2		Good	Regulate	Good	Yes			Good
			Fair	Odor	Poor		Yes		Fair
$3	1		Good	Expansion valve, thermo	Good	Yes		800	Good
			Fair	Leaks, odor, factory inspection	Good	Yes		660	Fair
			Good	Float valve	Good	Yes		720	Good
	12		Poor	Leaks, odor, factory inspection	Poor		Yes	660	Poor
	1		Good		Good	Yes			Good
			Good	Expansion valve	Good	Yes		720	Good
			Good	Expansion valve	Good	Either			Good
			Good	Belts, expansion valve	Good	Yes		800	Good
			Good		Good	Yes			Good
$4–5	6		Poor	Sticky valves, odor	Fair	Yes		720	Poor
			Good		Good	Yes			Good
			Good	Regulate, float valve	Poor	Yes		720	Good
	1		Good	Temperature regulate	Fair		Yes	720	Good
								800	
	1		Good	Regulate temperature	Good	Yes			Good
			Poor	Leaks, odor	Good			720	Fair
	1		Good	Adjustments	Good	Yes			Good
	1		Good	Thermo, comp. stuck	Poor	Yes		720	Good
			Good		Good	Yes		720	Good
	10		Poor	Leaks, belt	Fair		Yes	720	Fair
$4–6			Fair	Thermo, expansion valve	Fair	Yes		720	Good
	6		Poor	Leaks	Fair		Yes	720	Poor
					Good				Good
			Good	Expansion valve	Good	Yes			Good
	1		Good	Thermo	Good		Yes	720	Good
	8	Monthly	Poor	Leaks	Good	Yes		750	Fair
	½		Good		Good				Good
			Fair	Leak, thermo	Poor	Yes		720	Fair
	1		Good	Regulate, temperature	Good	Yes			Good
	10		Poor	Float, stuck comp.	Fair	Yes		720	Poor
			Good		Good	Yes			Good
		Monthly	Fair	Leaks, odor	Fair	Yes		660	Fair
			Good		Good	Yes			Good
$5			Good		Good	Yes		720	Good
		2 months	Good	Thermo	Good	Yes		540	Good
			Good		Good				Good
$3–5		3 months	Good	Temperature regulate	Good	Yes		720	Good
			Fair	Expansion valve	Fair	Yes		720	Good
			Good	Float valve	Good	Yes			Good
	8		Poor	Leaks, odor	Fair	Yes		720	Poor
			Good		Fair	Yes			Good
			Good	Float valve	Good	Yes			Good
			Fair	Expansion valve	Fair	Yes		800	Good
			Good		Good	Yes			Good
			Good		Good	Yes		750	Good
	3		Fair	Leak, float, odor	Good	Yes		850	Fair
			Good		Good	Yes			Good
	4		Fair	Leak, float, odor	Good	Yes		800	Fair
	1		Good	Float, regulate	Good	Yes			Good
			Poor	Thermo	Poor				Poor
			Fair					720	Good
			Good		Good				Good
			Good		Good	Yes			Good
$13.50	4		Fair	Leaks, float, factory inspection	Poor	Yes		800	Fair
	2		Good	Float	Good	Yes			Good
			Good						Good
									Fair
			Good	Thermo (A), Leaks (C)	Good	Yes		720	Fair
			Fair		Good				Good
$3–5	2		Good	Leak, regulate	Good	Yes			Good
		2 months	Good	Regulate	Good	Yes			Good
			Good	Leaks	Good	Either			Good
$10			Good	Leaks	Good	Either			Fair
$13			Fair	Leak, expansion valve	Good	Either			Good
			Good	Regulate	Good	Either			Good
			Good	Regulate	Good	Yes		700	Good
			Fair	Leaks, odor	Fair	Yes			Fair
$2.40	1		Good	Float, regulate	Good	Yes			Good
	1		Good	Regulate	Good		Yes		Good
			Fair	Leaks	Fair	Either			Good
$5			Good	Regulate	Good	Yes		800	Good
$5			Good	Leaks, odor	Good	Yes			Good
	10		Poor	Leaks, float, compres.	Good	Yes		800	Fair
			Good	Float, regulate	Good	Yes			Good

[1]Formerly sold A. [2]Company formerly sold A. [3]Will discontinue A and sell D. [4]No sales by either dealer. [8]This central station in ic
[9]Municipal lighting plant. [10]B and C dealers out of city; sales estimated. [11]Central station formerly sold A. [12]Three de
[15]Company has temporarily discontinued selling refrigerators. [16]Central station does not sell refrigerators.
[19]B dealer sells only commercial units. [20]Formerly sold A and C. [21]Dealer appeared indifferent.
[25]Central station is not active. [26]This dealer is closing out. [27]Distric

Satisfaction of Each Selling Outlet with Refrigerator Sold				Discount Allowed Per Cent	Relations of Retail Outlet with Refrigeration Manufacturer								Survey Report Importance of Outlet
Mechanical Construction	Quality in Manufacture	Operating Performance	Selling Features		Discount	Delivery of Units	Delivery of Repairs	Sales Assistance	Advertising Assistance	Installing Service	Billing Methods	Handling Time Payments	
Good	Good	Good	Good	15	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
				30–40									
Good	Good	Good	Good		Fair	Good		Fair	Fair	Fair			
Good	Good	Good	Good	40	Good	Good	Good	Fair	Fair	Good			
Poor	Poor	Poor	Good	41	Fair	Poor	Poor	Poor	Poor	Poor			
Good	Good	Good	Good		Fair	Good	Good	Good	Good	Good		Good	
Good	Good	Good	Good	40	Good	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Fair	Good			
Good	Good	Good	Good		Low	Good							
Fair	Fair	Good	Fair	35+	Fair	Poor	Good	Good	Fair	Fair			
Good	Good	Good	Good		Fair	Good	Good	Good	Good	Good			
Fair	Fair	Fair	Fair		Low	Fair	Poor	Poor	Poor	Fair	Poor		
Good	Good	Good	Good		Fair	Fair		Fair	Good	Good			
Fair	Fair	Fair	Fair		Fair	Good	Good	Fair	Fair	Fair			
Good	Good	Good	Good		Fair	Fair	Fair	Good	Good	Good			
Fair	Fair	Fair	Fair		Low	Good	Good	Fair	Fair	Fair			
Fair	Poor	Fair	Fair	42	Good	Good	Fair	Good	Fair	Fair			
Good	Good	Good	Good		Fair	Good	Good			Good			
Poor	Poor	Fair	Fair	42	Fair	Good	Poor	Fair	Fair	Fair			
Good	Good	Good	Good		Fair	Good	Good	Fair					
Good	Good	Good	Good		Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	25	Too low	Poor	Fair	Poor	Poor	Fair	Poor		
Good	Good	Good	Good	25	Too low	Good		Poor	Poor		Poor		
C-Fair D-Good	C-Poor D-Good	Fair	Good	42	Good	Good	Good	Fair	Fair	Fair			
Good	Good	Good	Good	25	Fair	Fair	Good	Good	Good	Good	Poor		
Good	Good	Good	Good	42	Good	Fair	Good	Good	Good	Good	Good		
Good	Good	Good	Good	42	Good	Fair	Good	Fair	Fair	Good			
Good	Good	Good	Good	25	Too low	Poor	Fair	Good	Good	Good	Poor		
Fair	Fair	Good	Good		Low	Fair	Poor	Poor	Poor	Fair			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good	Good		
Good	Good	Good	Good		Fair	Good	Good	Fair	Fair	Good			
Fair	Good	Fair	Good	40	Fair	Good	Good	Fair	Fair	Fair			
Fair	Poor	Fair	Good	42	Good	Good	Good	Fair	Fair	Fair			
Good	Good	Good	Good	25	Low	Good	Good	Good	Good	Good		Good	
Good	Good	Good	Good	25	Low	Good	Good	Good	Good	Good		Fair	
Fair	Good	Good	Good	35	Low	Fair	Good	Fair	Poor	Fair	Poor		
Good	Good	Good	Good		Good	Good	Good	Good	Good	Fair		Good	
Fair	Fair	Fair	Fair	42+	Good	Poor	Fair	Poor	Poor	Fair			
Good	Good	Good	Good	33	Too low	Good	Good	Fair	Fair	Good			
Fair	Fair	Fair	Good	42	Good	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	20	Too low	Good	Good	Good	Good	Good			
Poor	Poor	Poor	Poor	40		Good	Poor	Fair	Poor	Poor			
Good	Good	Good	Good	25	Too low	Good	Good	Good	Good	Good	Poor		
Good	Good	Good	Good	20	Too low	Good	Good	Good	Good	Good			
Good	Good	Good	Good			Good	Fair	Good		Good			
Good	Fair	Good	Fair	35	Fair	Poor	Poor	Poor	Poor	Fair			
Good	Good	Good	Good	20	Too low	Good	Good	Good	Good	Good			
Poor	Poor	Fair	Fair	40	Fair	Good	Fair	Fair	Good	Fair			
Good	Good	Good	Fair		Fair	Fair	Good	Good	Poor	Good			
Good	Good	Good	Good	30	Low	Poor	Fair	Poor	Poor	Poor	Poor		
Good	Fair	Good	Good	30	Too low	Poor	Poor	Poor	Poor	Poor	Poor		
Good	Good	Good	Good		Fair	Good	Good	Good	Good	Good			
Fair	Fair	Good	Good	42	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good		Fair	Good	Good	Good	Good	Good			
Good	Fair	Good	Good		Low	Poor	Poor	Poor	Poor	Poor			
Good	Good	Good	Good		Low	Good	Good	Good	Good	Good			
Fair	Poor	Poor	Good	40	Fair	Fair	Fair	Fair	Fair	Fair			
Good	Good	Good	Good		Fair	Fair	Fair	Poor	Poor	Fair			
Poor	Poor	Fair	Fair	40	Fair	Fair	Poor	Fair	Fair	Poor			
Good	Good	Good	Good		Fair	Good		Fair	Good	Good			
Good	Good	Good	Good		Good	Good	Good	Good	Good	Good	Good	Good	
Good	Good	Good	Good		Fair	Fair		Fair	Fair	Good			
Fair	Poor	Fair	Good	40	Fair	Fair		Fair	Fair	Good			
Good	Good	Good	Good		Low	Good	Fair	Fair	Fair	Good			
Good	Good	Good	Good		Fair	Good		Fair	Good	Good			
Fair	Fair	Good	Fair		Low	Fair	Poor	Poor	Poor	Poor			
Good	Good	Good	Good		Good	Good	Good	Good	Good	Good	Good		
Poor	Poor	Poor	Fair	40	Fair	Good	Good	Fair	Fair	Poor			
Good	Good	Good	Good		Fair	Good	Good	Fair	Fair	Fair			
Fair	Fair	Good	Fair	40	Fair	Good	Fair	Fair	Fair	Good			
Good	Good	Good	Good			Good	Good	Fair	Good	Good			
Good	Good	Good	Good		Fair	Good		Good	Good	Good			
Good	Good	Good	Good	40	Fair	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good										
Good	Good	Good	Good	30	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Fair		Fair	Good	Poor	Fair	Fair	Fair			
Good	Good	Good	Good	25	Fair	Good	Good	Good	Good	Good			
Poor	Poor	Poor	Fair	40	Good	Good	Good	Fair	Fair	Poor			
Good	Good	Good	Good		Fair	Good		Fair	Fair	Fair			
Good	Good	Good	Good	40	Good	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good		Fair	Good		Fair	Fair	Good		Good	
Good	Good	Good	Good	35+	Fair	Fair	Good	Fair	Fair	Fair			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
Good	Good	Good	Good	30	Fair	Good	Good	Fair	Good	Good			
Fair	Fair	Good	Good	42	Good	Good	Good	Good	Fair	Good			
Good	Good	Good	Good	30	Fair	Good	Good	Good	Fair	Good		Good	
Good	Good	Good	Poor	25	Too low	Good		Poor	Poor		Poor		
Fair	Poor	Good	Good	42	Good	Good	Fair	Good	Fair	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
Poor	Poor	Poor	Poor	30	Too low	Poor	Poor	Poor	Poor	Poor	Poor	Poor	
				25	Too low	Good		Poor	Poor	Poor			
Good	Good	Good	Good	40	Good	Good							
Good	Good	Good	Fair	25	Low	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	25	Too low	Good		Fair	Good	Good			
Fair	Poor	Good	Good	42	Good	Fair	Poor	Fair	Fair	Fair			
Good	Good	Good	Good	30	Good	Good	Good	Good	Good	Good	Good	Good	
Good	Good	Good	Fair	30	Too low	Good		Fair	Fair	Fair			
Fair	Fair	Fair		35	Fair								
Fair	Fair	Fair	Good			Good	Good		Good	Good			
Good	Good	Good	Good	30	Too low	Good	Good	Poor	Fair	Fair	Poor		
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good	Good	Good	
Good	Good	Good	Good	43	Fair	Good	Good	Fair	Fair	Good			
Fair	Fair	Good	Good	42	Fair	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	35	Fair	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	40	Fair	Good	Good	Fair	Poor	Fair			
Fair	Fair	Good	Good	42+	Good	Good	Fair	Fair	Good	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	40	Good	Poor		Fair	Good	Good			
Good	Good	Good	Good	35+	Fair	Fair	Good	Fair	Fair	Fair			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
Good	Good	Good	Good	30	Fair	Good	Good	Fair	Good	Good			
Fair	Fair	Good	Good	42	Good	Good	Good	Good	Fair	Good			
Good	Good	Good	Good	30	Fair	Good	Good	Good	Fair	Good		Good	
Good	Good	Good	Poor	25	Too low	Good		Poor	Poor		Poor		
Fair	Poor	Good	Good	42	Good	Good	Fair	Good	Fair	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
Poor	Poor	Poor	Poor	30	Too low	Poor	Poor	Poor	Poor	Poor	Poor	Poor	
				25	Too low	Good		Poor	Poor	Poor			
Good	Good	Good	Good	40	Good	Good							
Good	Good	Good	Fair	25	Low	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	25	Too low	Good		Fair	Good	Good			
Fair	Poor	Good	Good	42	Good	Fair	Poor	Fair	Fair	Fair			
Good	Good	Good	Good	30	Good	Good	Good	Good	Good	Good	Good		
Good	Good	Good	Fair	30	Too low	Good		Fair	Fair	Fair			
Fair	Fair	Fair		35	Fair								
Fair	Fair	Fair	Good			Good	Good		Good	Good			
Good	Good	Good	Good	30	Too low	Good	Good	Poor	Fair	Fair	Poor		
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good	Good	Good	
Good	Good	Good	Good	43	Fair	Good	Good	Fair	Fair	Good			
Fair	Fair	Good	Good	42	Fair	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	35	Fair	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	40	Fair	Good	Good	Fair	Poor	Fair			
Fair	Fair	Good	Good	42+	Good	Good	Fair	Fair	Good	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	40	Good	Poor		Fair	Good	Good			
Good	Good	Good	Good	35+	Fair	Fair	Good	Fair	Fair	Fair			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
Good	Good	Good	Good	30	Fair	Good	Good	Fair	Good	Good			
Fair	Fair	Good	Good	42	Good	Good	Good	Good	Fair	Fair	Good		
Good	Good	Good	Good	30	Fair	Good	Good	Good	Fair	Good		Good	
Good	Good	Good	Poor	25	Too low	Good		Poor	Poor		Poor		
Fair	Poor	Good	Good	42	Good	Good	Fair	Good	Fair	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
Poor	Poor	Poor	Poor	30	Too low	Poor	Poor	Poor	Poor	Poor	Poor	Poor	
				25	Too low	Good		Poor	Poor	Poor			
Good	Good	Good	Good	40	Good	Good							
Good	Good	Good	Fair	25	Low	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	25	Too low	Good		Fair	Good	Good			
Fair	Poor	Good	Good	42	Good	Fair	Poor	Fair	Fair	Fair			
Good	Good	Good	Good	30	Good	Good	Good	Good	Good	Good	Good		
Good	Good	Good	Fair	30	Too low	Good		Fair	Fair	Fair			
Fair	Fair	Fair		35	Fair								
Fair	Fair	Fair	Good			Good	Good		Good	Good			
Good	Good	Good	Good	30	Too low	Good	Good	Poor	Fair	Fair	Poor		
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good	Good	Good	
Good	Good	Good	Good	43	Fair	Good	Good	Fair	Fair	Good			
Fair	Fair	Good	Good	42	Fair	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	35	Fair	Good	Good	Fair	Fair	Good			
Good	Good	Good	Good	40	Fair	Good	Good	Fair	Poor	Fair			
Fair	Fair	Good	Good	42+	Good	Good	Fair	Fair	Good	Good			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good			
Good	Good	Good	Good	40	Good	Poor		Fair	Good	Good			
Good	Good	Good	Good	35+	Fair	Fair	Good	Fair	Fair	Fair			
Good	Good	Good	Good	40	Good	Good	Good	Good	Good	Good		Good	
Good	Good	Good	Good	30	Fair	Good	Good	Fair	Good	Good			
Fair	Fair	Good	Good	42	Good	Good	Good	Good	Fair	Good

Locality	Approximate Number of Domestic Customers	Number of Electric Refrigerators				Central-Station Executive Reaction to Electric Refrigeration	Relations With Ice Industry	Total Number Electric Refrigerator Selling Outlets	Total Number Electric Refrigerator Salesmen	Local Selling Outlets		
		On Lines	Commercial	Domestic	Total Estimated Sales For 1927					Make of Refrigerator	Type of Dealer	Number in Sales Staff
1	20,000	316	15	301	700	Favorable	Good	3	10	A B C	Cent. sta. Spl. dealer Spl. dealer	4 5 1
2	5,000	222	100	122	210	Favorable	Good	4	8	A B C N	Cent. sta. Elec. dealer Mach. supply Elec. dealer	4 2 1 1
3	12,000	296	20	276	555	Good	Neutral	4	7	A B F E	Cent. sta. Elec. dealer Elec. dealer Spl. dealer	3 2 1 1
4	7,500	140	20	120	250	Favorable	Good	2	2	C B	Cent. sta. Hdw. dealer	1 1
5	6,000	235	15	220	260	Favorable	Poor	3	4	C B A	Cent. sta. Free lance Elec. dealer	2 1 1
6	8,000	125	4	121	125	Neutral	Good	4	..	A A B C	Cent. sta. Deal.-dist. Htg. co. Plumber	.. 1 .. ..
7	40,000	741	80	661	1,420	Favorable	Unsettled	6	14	B A C F D N	Dist. dealer Dept. store Oil htg. Spl. dealer Spl. dealer Dist. dealer	6 3 2 1 1 1
8	4,200	71	20	51	200	Favorable	Good	3	3	C B A	Cent. sta. Elect. dealer Elect. dealer	1 1 1
9	25,000	293	30	263	435	Inactive	Dormant	5	10	D B A F N	Cent. sta. Dist. dealer Elect. dealer Cont. dealer Spl. dealer	.. 4 6 .. ..
10	26,000	300	50	250	500	Favorable	Neutral	3	8	B A C	Spl. dealer Spl. dealer Spl. dealer	2 3 3
11	7,000	80	30	50	100	Favorable	Good	2	2	C B	Cent. sta. Agent	1 ..
12	8,500	186	6	180	600	Favorable	Good	4	5	B-C-D B A N	Cent. sta. Spl. dealer Elect. dealer Dept. store	1 3 1 ..
13	16,000	146	15	131	225	Favorable	Good	4	2	A B B C S-Z	Cent. sta. Auto. supply Elect. dealer Spl. dealer Furn. radio	1 1 .. .. ..
14	40,000	650	150	500	1,450	Good	Good	7	15	A A B C B-Z-2A	Cent. sta. Deal. dist. Dist. dealer Dept. store Misc.	2 3 4 3 3
15	80,000	2,052	255	1,797	2,775	Favorable (2 utility companies) Favorable	Good Good	7	32	A C B B D F E	Cent. sta. Dist. dealer Dist. dealer Cent. sta. Oil htg. Oil htg. Spl. dealer	15 2 10 2 1 .. 2
16	45,000	734	134	600	1,125	Favorable	Quiet	5	9	B B A C E	Cent. sta. Dist. dealer Dist. dealer Dist. dealer Oil htg.	1 3 2 2 1
17	3,500	200	10	190	110	Favorable	Good	3	3	A B C	Cent. sta. Elect. dealer Furn. store	1 1 1
18	44,500	370	50	320	1,125	Good	Good	..	..	A B C F	Cent. sta. Agent Agent Elect. dealer	6 1 1 1
19	7,700	353	40	313	1,000	Good	Good	2	10	B A	Cent. sta. Spl. dealer	8 2
20	22,000	279	100	179	720	Neutral	Good	3	6	C A B	Cent. sta. Spl. dealer Spl. dealer	 4
21	450	34	...	34	60	Good	Good	1	1	B	Cent. sta.	1
22	3,500	143	28	115	250	Favorable	Neutral	2	6	C B	Cent. sta. Elect. dealer	2 4
23	1,000	16	...	16	50	Good	Good	1	..	B	Cent. sta.	..
24	41,000	1,160	200	960	1,550	Favorable	Good	2	10	B A	Cent. sta. Spl. dealer	10 ..
25	20,000	285	120	165	1,200	Favorable	Good	3	12	A-C-D B	Cent. sta. Spl. dealer	16 6
26	18,000	130	18	112	290	Favorable	Good	2	1	A-C B	Cent. sta. Elect. dealer	.. 1
27	5,400	103	...	103	350	Favorable	Good	2	9	B A	Cent. sta. Elect. dealer	9 ..
28	12,000	414	29	385	730	Favorable	Neutral	2	..	B A	Spl. dealer Spl. dealer	.. ..
29	4,000	59	15	44	160	Favorable	Neutral	2	1	B A	Elect. dealer Hdw. store	1 ..
30	24,000	566	175	391	1,350	Favorable	Good	2	7	B & C A	Cent. sta. Elect. dealer	6 1
31	33,000	1,475	200	1,275	1,250	Favorable	Neutral	3	11	A B C	Dist. dealer Dist. dealer Oil htg.	3 7 1
32	250,000	3,425	400	3,025	6,850	Favorable	Good	12	73	A-B-C A C A B C E-Z-AB-N-4A-S	Cent. sta. Cent. sta. Cent. sta. Dist. dealer Dist. dealer Dist. dealer Spl. dealers	5 1 5 .. 40 15 7
33	6,200	153	30	123	530	Neutral	Quiet	5	5	B A C D F	Spl. dealer Elect. dealer Elect. dealer Elect. dealer Dist. dealer	2 1 1 .. 1
34	28,000	356	15	341	690	Favorable	Good	3	9	C B A	Cent. sta. Oil htg. Dist. dealer	.. 6 3
35	22,000	1,000	100	900	675	Neutral	Antagonistic	7	8	B F C-W-D A	Elec. dealer Plumber Elect. dealer Dist. dealer	3 5
36	20,000	600	50	550	450	Favorable	Good	4	7	C-D A F B	Cent. sta. Dist. dealer Elect. dealer Elect. dealer	.. 6 1 ..
37	14,000	525	100	425	1,025	Favorable	Uncertain	3	6	C B A	Cent. sta. Spl. dealer Elect. dealer	2 3 1
38	7,000	445	20	425	500	Favorable	Unsettled	3	12	C B A	Cent. sta. Spl. dealer Spl. dealer	.. 6 6
39	10,500	110	10	100	300	Favorable	Good	2	8	A-U B	Cent. sta.	5 3
40	22,000	499	45	454	550	Neutral	Good	7	5	C B A V-F-R-W	Cent. sta. Spl. dealer Dist. dealer Hdw. & Furn. stores	.. 4 1 ..
41	170,000	8,745	2,523	6,222	6,650	Favorable	Unsettled	9	69	A B C D G T-K-S-1A	Cent. sta. Dist. dealer Dist. dealer Elect. dealer Elect. dealer Misc. dealers	18 30 15 2 4 ..

tlets			Number Units Sold, Jan. 1—Aug. 15/26			Sales Estimate for 1927		Selling Method Used			Sales Plan			Special Training for Salesmen
Number in Sales Staff	Time in Refrigerator Business Years	Mos.	Commercial	Domestic	Per Cent Remote	Commercial	Domestic	Resale Plan	Special Men	General Sales Force	Continuous	Continuous and Campaign	Seasonal	
4	2		15	150	80	.....	350	.....	Yes	.....	Yes	.....	.....	1 month
5	2		.....	40	85	.....	150	.....	Yes	.....	Yes	.....	.....	2 weeks
1		4	.....	40	.....	.....	100	.....	Yes	.....	Yes	.....	.....	.....
4	4		.....	35	75	.....	100	.....	Yes	.....	Yes	.....	.....	2 weeks
2	1		10	15	80	.....	40	.....	.....	Yes	Yes	.....	.....	.....
1	1		4	16	80	.....	50	.....	Yes	.....	Yes	.....	.....	.....
1		2	.....	6	.....	.....	20	.....	.....	Yes	.....	.....	Yes	.....
3	2		.....	150	.....	.....	300	.....	Yes	Yes	Yes	.....	.....	2 weeks
2	2		20	40	.....	50	150	.....	Yes	.....	Yes	.....	.....	.....
1	1		.....	15	.....	.....	30	.....	.....	Yes	Yes	.....	.....	.....
1	1		.....	6	.....	.....	25	.....	.....	Yes	Yes	.....	.....	.....
1	1		6	35	15	25	125	.....	Yes	.....	Yes	.....	.....	2 weeks
1	2		.....	.....	75	.....	100	.....	.....	Yes	Yes	.....	.....	.....
2	2		24	40	50	.....	100	.....	Yes	.....	Yes	.....	.....	3 weeks
1	1		.....	30	.....	.....	60	.....	Yes	.....	Yes	.....	.....	.....
1	2		.....	30	.....	.....	100	.....	.....	.....	Yes	.....	.....	.....
..	2		.....	4	.....	.....	.....	.....	.....	Yes	.....	.....	Yes	.....
1	5		.....	40	70	.....	75	.....	Yes	.....	Yes	.....	.....	1 month
..	2		.....	12	60	.....	50	.....	.....	Yes	.....	.....	Yes	.....
..		6	.....	1	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....
6	3		.....	184	70	.....	500	.....	Yes	.....	Yes	.....	.....	2 weeks
3	2		.....	83	80	.....	350	.....	Yes	.....	Yes	.....	.....	2 weeks
2	1		.....	30	70	.....	150	.....	.....	Yes	.....	.....	Yes	.....
1		6	.....	22	.....	.....	200	.....	Yes	.....	Yes	.....	.....	2 weeks
1	1		.....	12	.....	.....	100	.....	Yes	.....	Yes	.....	.....	.....
1		1	.....	4	.....	.....	120	.....	Yes	.....	Yes	.....	.....	.....
1	1		.....	20	25	.....	50	.....	Yes	.....	Yes	.....	.....	2 weeks
1		6	.....	15	60	60	90	.....	.....	Yes	Yes	.....	.....	.....
1	1		.....	4	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
..			.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
4	2		30	70	80	30	220	.....	Yes	.....	Yes	.....	.....	2 weeks
6	2		.....	150	50	.....	200	.....	Yes	.....	Yes	.....	.....	2 weeks
..	1		.....	10	.....	.....	.....	.....	.....	Yes	.....	.....	Yes	.....
..		6	.....	3	.....	.....	15	.....	Yes	.....	Yes	.....	.....	.....
2	1		5	40	70	.....	150	.....	Yes	.....	Yes	.....	.....	3 weeks
3		6	3	69	75	.....	150	.....	Yes	.....	Yes	.....	.....	2 weeks
3	1		.....	45	50	.....	200	.....	Yes	.....	Yse	.....	.....	3 weeks
1	1		.....	25	60	.....	50	.....	Yes	.....	Yes	.....	.....	.....
..	1		.....	25	50	.....	50	.....	.....	Yes	.....	.....	Yes	.....
1	2		.....	27	80	.....	150	.....	Yes	.....	Yes	.....	.....	1 week
3	2		.....	100	80	.....	350	.....	Yes	.....	Yes	.....	.....	2 weeks
1	2		.....	18	70	.....	100	.....	.....	Yes	Yes	.....	.....	.....
..		6	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	4		.....	34	95	.....	100	.....	Yes	.....	Yes	.....	.....	2 weeks
1	2		.....	24	80	.....	75	.....	Yes	.....	Yes	.....	.....	.....
..		6	.....	10	75	.....	.....	.....	.....	Yes	.....	.....	Yes	.....
..		6	.....	13	50	.....	50	.....	Yes	.....	.....	.....	.....	.....
..			.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2		6	.....	25	80	.....	350	.....	Yes	.....	Yes	.....	.....	3 weeks
3	3		.....	100	70	.....	200	.....	Yes	.....	Yes	.....	.....	2 weeks
4	2		.....	131	80	100	300	.....	Yes	.....	Yes	.....	.....	2 weeks
3	2		50	100	.....	.....	350	.....	Yes	.....	Yes	.....	.....	2 weeks
3	1		.....	90	.....	.....	150	.....	.....	.....	.....	.....	.....	.....
15	8		15	150	75	.....	900	Yes	.....	.....	Yes	.....	.....	1 month
2	2		40	20	50	.....	.....	.....	Yes	.....	Yes	.....	.....	2 weeks
10	2		.....	750	75	.....	1,000	.....	Yes	.....	Yes	.....	.....	2 weeks
2	2		.....	100	10	.....	400	.....	Yes	.....	Yes	.....	.....	1 month
1	1		.....	12	.....	.....	200	.....	.....	Yes	Yes	.....	.....	2 weeks
..	1		.....	15	.....	.....	275	.....	Yes	.....	Yes	.....	.....	.....
2	2		.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1		2	1	6	60	.....	200	.....	Yes	.....	Yes	.....	.....	3 weeks
3	2		.....	300	75	.....	500	.....	Yes	.....	Yes	.....	.....	2 weeks
2	2		.....	150	60	.....	300	.....	Yes	.....	Yes	.....	.....	.....
2	1		.....	50	50	.....	125	.....	Yes	.....	Yes	.....	.....	2 weeks
1	1		.....	75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	2		.....	50	10	.....	100	.....	.....	Yes	Yes	.....	.....	.....
1	1		.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1	1		.....	4	.....	.....	10	.....	.....	Yes	Yes	.....	.....	.....
6	3		.....	117	80	.....	350	.....	Yes	.....	Yes	.....	.....	3 weeks
1	1		.....	10	.....	200	300	.....	.....	.....	.....	.....	.....	.....
1	1		.....	12	.....	50	150	.....	.....	.....	.....	.....	.....	.....
1	1		.....	35	80	.....	75	.....	Yes	.....	Yes	.....	.....	2 weeks
8		6	.....	261	75	.....	750	.....	Yes	.....	.....	Yes	.....	No
2		6	.....	52	75	.....	250	.....	Yes	.....	Yes	.....	.....	2 weeks
..	1		.....	60	80	.....	.....	.....	.....	Yes	.....	.....	Yes	1 week
..		1	2	100	60	.....	500	.....	Yes	.....	Yes	.....	.....	2 weeks
4		2	4	15	.....	20	200	.....	Yes	.....	Yes	.....	.....	2 weeks
1	1		.....	25	80	.....	60	.....	.....	Yes	.....	.....	Yes	1 week
2	1		5	35	75	.....	.....	.....	.....	Yes	Yes	.....	.....	2 weeks
4	1		23	78	60	50	200	.....	Yes	.....	Yes	.....	.....	2 weeks
..	1		.....	16	10	.....	50	.....	.....	Yes	Yes	.....	.....	.....
10	1		.....	800	40	.....	1,200	Yes	.....	.....	Yes	.....	.....	2 weeks
..	1		.....	160	60	.....	350	.....	Yes	.....	Yes	.....	.....	2 weeks
16		2	100	125	50	200	600	.....	Yes	.....	Yes	.....	.....	2 weeks
6		2	20	40	60	100	300	.....	Yes	.....	Yes	.....	.....	.....
..	1		.....	40	.....	.....	80	.....	.....	Yes	.....	.....	Yes	.....
1	1		18	72	.....	40	150	.....	Yes	.....	Yes	.....	.....	.....
9	1		.....	100	80	.....	300	.....	.....	Yes	Yes	.....	.....	1 week
..		½	.....	3	.....	.....	50	.....	.....	Yes	Yes	.....	.....	.....
..		6	21	315	.....	50	500	.....	Yes	.....	Yes	.....	.....	.....
..	1	6	8	70	.....	60	120	.....	.....	.....	Yes	.....	.....	.....
1	1		15	44	.....	25	100	.....	Yes	.....	Yes	.....	.....	2 weeks
..		1	.....	10	.....	.....	35	.....	.....	Yes	Yes	.....	.....	.....
6	2		.....	316	15	250	800	.....	Yes	.....	Yes	.....	.....	1 month
1	3		.....	75	40	.....	300	.....	Yes	.....	Yes	.....	.....	2 weeks
3	1		.....	250	50	.....	500	.....	Yes	.....	Yes	.....	.....	6 weeks
7	2		75	300	75	150	500	.....	Yes	.....	Yes	.....	.....	2 months
1	1		.....	25	.....	.....	100	.....	.....	Yes	.....	.....	Yes	.....
5	1		.....	200	60	.....	750	.....	Yes	.....	Yes	.....	.....	1 month
1	1		.....	50	60	.....	250	.....	Yes	.....	Yes	.....	.....	1 month
5	2		.....	175	60	.....	150	.....	Yes	.....	Yes	.....	.....	1 month
..	2		.....	500	.....	.....	1,800	.....	Yes	.....	Yes	.....	.....	2 weeks
40	2		300	800	75	.....	2,700	.....	Yes	.....	Yes	.....	.....	2 weeks
15	2		.....	300	.....	.....	1,200	.....	Yes	.....	Yes	.....	.....	2 weeks
7	2	1	.....	200	.....	.....	.....	.....	.....	Yes	Yes	.....	Yes	.....
2	1		30	90	90	50	250	.....	Yes	.....	Yes	.....	.....	.....
1		1	.....	15	.....	.....	150	.....	.....	Yes	Yes	.....	.....	.....
1		4	.....	12	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
..		1	.....	2	.....	.....	80	.....	.....	Yes	Yes	.....	.....	.....
1		1	.....	4	.....	.....	.....	.....	.....	Yes	.....	.....	Yes	.....
..		1	.....	15	60	.....	150	.....	.....	Yes	.....	.....	Yes	No
6	1		15	110	65	40	300	.....	.....	Yes	.....	.....	Yes	.....
3	2	6	.....	80	.....	.....	200	.....	Yes	.....	Yes	.....	.....	.....
3	1		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
..		½	.....	2	.....	.....	75	.....	.....	.....	.....	.....	Yes	.....
..	1		.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
5	2		.....	300	60	.....	600	.....	Yes	.....	Yes	.....	.....	.....
..	1		.....	8	50	.....	.....	.....	.....	Yes	.....	.....	.....	.....
6	1		.....	120	75	.....	300	.....	Yes	.....	Yes	.....	Yes	.....
1	1		.....	65	.....	.....	150	.....	Yes	.....	Yes	.....	.....	.....
..	1		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2	1		.....	75	80	.....	250	.....	Yes	.....	Yes	.....	Yes	3 weeks
3	1		.....	300	75	.....	650	.....	Yes	.....	Yes	.....	.....	2 weeks
1	1		.....	50	50	.....	125	.....	.....	Yes	Yes	.....	.....	.....
..	1		.....	50	60	.....	100	.....	.....	Yes	Yes	.....	.....	No
6	1		20	250	75	40	200	.....	Yes	.....	Yes	.....	.....	2 weeks
6	1	6	.....	125	60	.....	160	.....	Yes	Yes	.....	.....	.....	2 weeks
5	1		.....	50	60	.....	150	.....	.....	Yes	Yes	.....	.....	.....
3	1		10	50	75	25	125	.....	Yes	.....	Yes	.....	.....	2 weeks
..		4	.....	14	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....
4	1		.....	200	80	.....	400	.....	Yes	.....	Yes	.....	.....	2 weeks
1	1		.....	60	65	.....	150	.....	Yes	.....	Yes	.....	.....	2 weeks
..			.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
18	2		.....	750	50	.....	1,800	Yes	.....	.....	Yes	.....	.....	.....
30	3		650	1,200	75	.....	2,500	.....	Yes	.....	Yes	.....	.....	2 weeks
15	2		.....	500	60	.....	900	.....	Yes	.....	Yes	.....	.....	2 weeks
2	1		.....	60	.....	.....	150	.....	Yes	.....	Yes	.....	.....	.....
4	1		.....	150	.....	.....	300	.....	Yes	.....	Yes	.....	.....	.....
..	2	1	.....	250	.....	.....	1,000	Yes	Yes	Yes	Yes	Yes	Yes	.....

Eastern States Continued on Pages 8 and 9

Compensation of Salesmen		Dealings with User of Refrigerator				Financing Time Payments	
Method	Commission Per Cent	Installation Charge	Length of Time Payment, Months	Discount for Cash	Free Service Period	Local	Manufacturer
Commission	15	$25–$50	12		1 year	Yes	
Commission	10		12–18		1 year		Yes
Commission	15	$25–$60	12		1 year	Yes	
					1 year	Yes	
			12–18	5%	1 year	Yes	
			12–18			Yes	
			12–24				Yes
			12				
			12				
Salary and commission	$100+5%	$20	24		1 year	Yes	
					1 year	Yes	
Salary and commission	$60+10%		24		1 year	Yes	
			12		1 year	Yes	
			12		1 year	Yes	
					1 year	Yes	
Commission	10		12–24		1 year		Yes
			12		1 year	Yes	
			18		1 year	Yes	
		$15			3 months	Yes	
					1 year		
			12		1 year	Yes	
Salary and commission			18		1 year	Yes	
					1 year		
		$50					
Commission	10		18		1 year		Yes
Commission	10		18		3 months	Yes	
					1 year		
Commission	10		12–24		1 year		
Commission	10		12–18		3 months	Yes	
Commission	12		12–18		1 year	Yes	
Salary			12–18		1 year	Yes	
		Estimated			1 year		
Salary			12–24		1 year	Yes	
Commission	10		12–24		6 months		Yes
			18		1 year	Yes	
Salary and commission	10	$35	12		1 year	Yes	
			12–24		1 year		Yes
			12		1 year		
Commission	10		12		1 year	Yes	
Commission	10	$35	12		3 months	Yes	
Commission	10		12–24		1 year		Yes
			12		1 year	Yes	
Salary and commission			18		1 year	Yes	
Commission			18		1 year	Yes	
Commission	10		12–24		1 year		Yes
Salary and commission			18		1 year	Yes	
			12		1 year	Yes	
		$15					
Commission	15	$15–$30	12		1 year	Yes	
Commission	10		12–24		3 months		Yes
Commission	10		12		3 months	Yes	
Commission	10		12		3 months	Yes	
Commission	15	$30	12		1 year	Yes	
			12				
Commission	10		12		1 year	Yes	
Commission	10	$15	24		1 year	Yes	
Commission	10		24		Indefinite	Yes	
Commission	10		24		1 year		Finance co.
			24		1 year	Yes	
Commission	10		24		1 year	Yes	
Commission	10		24		1 year		Yes
			12		1 year	Yes	
			24		1 year	Yes	
Commission	10		12		1 year	Yes	
			24		Indefinite	Yes	
Commission	10		24		1 year	Yes	
Commission	10		24		1 year	Yes	
			24		1 year	Yes	
Commission	10		12–24		1 year		Yes
			12		1 year	Yes	
			18		3 months		
Salary							
			24		1 year	Yes	
			24		1 year		Finance co.
			24		3 months		Finance co.
			24		3 months		Finance co.
Commission	10		12		1 year	Yes	
Commission	13	$40	12		1 year	Yes	
			12		3 months	Yes	
Commission	15	$20	12		3 months	Yes	
Commission	10		12–24		1 year		Yes
Salary		$50	18		1 year		Yes
Salary		$50	18		1 year		
Salary			18		1 year	Yes	
Commission	10		18		1 year	Yes	
Commission	10		12–24		1 year		Yes
Commission			12–24		1 year	Yes	
Salary and commission			12–24				
			3			Yes	
Commission	10				3 months		
			12		1 year	Yes	
		$15	12			Yes	
Salary and commission	7	$30	12		1 year	Yes	
Commission			24		1 year		Yes
Commission							
			12		1 year	Yes	
Commission	15–12½	$10 to $60	12	2	1 year	Yes	
		$15	None		1 year		
Salary		$20 to $40	12		1 year	Yes	
Commission			12–24		1 year		Yes
Commission	5		12–24		1 year	Yes	
Commission	10	$25	12–24		1 year		Yes
Commission	15		12		3 months	Yes	
Commission	10		12	5	1 year	Yes	
Commission	10		12–24		1 year		Yes
Commission		$30–$65	12–24		1 year	Yes	
Commission		$25–$60	12		3 months	Yes	
Commission	10	$25–$60	12–18		1 year	Yes	
Commission	10		12–24		1 year		Yes
Commission	10		12–18		1 year	Yes	
			12			Yes	
Commission	10		12–18		1 year	Yes	

ayments	Sales Resistances Encountered			Relations Among Local Outlets			Servicing Method			
Manu-facturer	First Cost	Anticipation of Price Reduction	Unconvinced of Final Development	Price-Cutting Claims	Unethical Sales Methods	Central-Station Unfair	Number of Men	Manufacturer's Branch	Own Force	Special Training for Service Men
	Yes			Yes			3		Yes	1 month
Yes	Yes	Yes		Yes			1	Yes	Yes	1 month
	Yes			No	No	No	1		Yes	3 months
		Yes		No	No	No	1		Yes	3 months
	Yes		Yes	No	No	No	1		Yes	3 months
							1		Yes	
	Yes			Yes	Yes		3		Yes	1 month
Yes	Yes			Yes	Yes	Yes	1		Yes	6 weeks
	Yes			Yes	Yes	Yes			Cont'r	
	Yes			Yes	Yes	Yes			Cont'r	
	Yes			No	No	No	1		Yes	3 months
				No	No	No	1		Yes	3 months
	Yes			Yes			1		Yes	3 months
								Yes		
	Yes			No			1	Yes		2 months
	Yes			No			1		Yes	
Yes	Yes	Yes		Yes		No	4	Yes		2 months
		Yes		Yes			3		Yes	3 months
	Yes	Yes					1		Yes	3 weeks
	Yes						1		Yes	1 month
	Yes								Yes	
	Yes	Yes					1		Yes	1 month
	Yes	Yes	Yes				1		Yes	1 month
							1		Yes	
				Yes						
Yes	Yes	Yes					2	Yes		2 months
	Yes	Yes		Yes			2	Yes		2 months
		Yes	Yes				1		Yes	
	Yes		Yes				1	Yes		
	Yes						2		Yes	2 months
	Yes	Yes					1		Yes	2 months
			Yes				1		Yes	1 week
			Yes			Yes		Yes		
	Yes						1		Yes	2 weeks
Yes	Yes	Yes					2	Yes		2 months
	Yes						1		Yes	2 weeks
	Yes			Yes			1		Yes	2 months
Yes	Yes							Yes		
				Yes		Yes		Yes		
	Yes		Yes				1		Yes	1 year
	Yes						2	Yes		1 year
Yes							1	Yes		3 months
	Yes		Yes				2		Yes	2 months
	Yes	Yes		Yes			1		Yes	1 month
	Yes	Yes		Yes	Yes		2	Yes		2 months
	Yes						2		Yes	2 months
	Yes	Yes					1		Yes	2 months
			Yes				1		Yes	1 month
			Yes				2	Yes		2 months
	Yes			Yes			2		Yes	2 months
Yes	Yes			Yes			6	Yes		6 months
	Yes	Yes	Yes							
Yes		Yes		No	No	No	2		Yes	3 months
	Yes						1		Yes	2 months
		Yes					3		Yes	2 months
		Yes					10	Yes		2 months
Yes				No	No	No	12	Yes		2 months
	Yes						5	Yes		2 months
			Yes							
	Yes						2		Yes	2 months
	Yes						2		Yes	2 weeks
	Yes						1		Yes	2 weeks
		Yes								
							1		Yes	1 month
	Yes		Yes				1		Yes	2 weeks
Yes	Yes						2		Yes	1 month
	Yes						2		Yes	2 weeks
			Yes				1		Yes	1 month
	Yes						2		Yes	1 month
	Yes						1		Yes	1 month
	Yes			Yes			3		Yes	1 month
	Yes						1		Yes	1 month
	Yes		Yes		Yes		1		Yes	2 months
Yes	Yes				Yes				Yes	3 months
			Yes		Yes		1		Yes	2 months
Yes		Yes			Yes	Yes	1	Yes		
			Yes				1		Yes	1 month
	Yes		Yes				1		Yes	1 month
Yes		Yes		Yes			2		Yes	2 months
	Yes						2		Yes	3 months
	Yes			Yes			2		Yes	1 month
	Yes							Yes		
Yes	Yes									
		Yes			Yes		5		Yes	2 months
	Yes						1		Yes	
		Yes	Yes				2		Yes	1 month

Eastern States Continued on Page 9

Yearly Cost per Unit	Servicing Experience of Each Outlet: Number Service Calls per Year	Frequency of Periodic Inspection	Ease of Repair	Complaints	Manufacturer's Service on Repair	Type of Unit Advocated for Home: Remote	Type of Unit Advocated for Home: Self-Contained	Kw.-Hr. per Unit per Year	Satisfaction of Each S with Refrigerato: Mechanical Construction	Quality in Manufacture	Ope Per a
	2	1 month	Fair	Thermo, exp. valve	Good	Yes		600	Good	Good	G
		6 weeks	Good		Good	Yes			Good	Good	G
		1 month	Good	Thermo	Good	Yes		600	Good	Good	G
		6 weeks	Good		Poor	Yes			Good	Good	G
		6 weeks	Fair		Fair	Yes			Fair	Fair	G
		2 months	Good	Leaks, noise	Fair	Yes		625	Good	Good	G
		6 weeks	Good	Adjustment	Fair	Yes			Good	Good	G
			Fair	Odor, leaks	Poor				Fair	Fair	F
			Fair								
		1 month	Poor	Leaks, odor	Fair		Yes	650	Poor	Poor	P
		6 weeks		Temp. cont.		Yes			Good	Good	G
									Good	Fair	G
		6 months	Fair	Float valve leak	Very Good	Yes		600			
					Good			600	Good	Good	G
			Fair		Good	Yes			Good	Good	G
	2		Good	Float valve inspec.	Good	Yes			Good	Good	G
			Poor	Odor, leaks	Poor				Poor	Poor	P
	2	2 months	Good	Float valve	Good	Yes		650	Good	Good	G
$5	2		Good	Thermo	Good	Yes			Good	Good	G
			Poor	Leaks, odor	Fair	Yes			Poor	Fair	P
			Good	Leaks	Good		Yes		Good	Good	G
			Good				Yes		Good	Good	G
			Poor	Odor, leaks, inspec.	Fair	Yes		580	Poor	Poor	F
			Good	Float valve, belt	Good	Yes			Good	Good	G
								600			
		6 weeks	Good	Float valve, regulator	Good	Yes			Good	Good	G
	5		Fair	Thermo belt	Fair	Yes			Fair	Good	G
			Fair	Leaks	Poor		Yes		Poor	Poor	
		6 weeks	Good	Float valve	Fair	Yes		630	Good	Good	G
			Fair		Fair	Yes			Good	Good	G
		2 weeks	Good		Good	Yes			Good	Good	G
	6		Fair	Leak, odor, float	Poor	Yes		720	Fair	Fair	F
		6 weeks	Good	Leak	Good	Yes			Good	Good	G
	6		Fair	Odor, leak	Good	Yes		600	Fair	Fair	G
		6 weeks	Good	Float valve	Good	Yes			Good	Good	G
	2		Good		Good	Yes			Good	Good	G
	2		Good	Thermo, exp. valve	Good	Yes		840	Good	Good	G
			Good		Good	Yes			Good	Good	G
			Good		Good	Yes		720	Good	Good	G
			Good		Good	Yes			Good	Good	G
		6 weeks	Good		Good	Yes			Good	Good	G
	3		Good	Float valve	Good	Yes			Good	Good	G
			Good	Float valve		Yes		720	Good	Good	G
			Good		Good		Yes		Good	Good	G
					Poor				Fair	Fair	F
			Good		Good	Yes		720	Good	Good	G
		None	Good	Float valve	Good	Yes			Good	Fair	G
	½		Good		Good	Yes			Good	Good	G
	1		Fair	Leaks	Good				Good	Good	G
			Good						Good	Good	G
			Fair	Thermo	Fair		Yes	500	Good	Good	G
				Leaks odor	Poor				Fair	Fair	F
	2	3 months	Fair	Thermo	Good	Yes		600	Good	Good	G
			Good	Leaks	Fair	Yes			Good	Good	G
			Good		Good	Yes		650	Good	Good	G
			Good		Good	Yes			Good	Good	G
			Poor	Leaks, odor	Poor	Yes		600	Poor	Poor	
			Good			Yes			Good	Good	G
					Good	Yes			Good	Good	G
			Good		Good	Yes		720	Good	Good	G
			Poor	Odor-temp. control	Poor	Yes		600	Fair	Poor	F
			Good		Good	Yes			Good	Good	G
			Good				Yes	600	Good	Good	G
			Good		Good			660	Good	Good	G
			Good		Good	Yes			Good	Good	G
		2 months	Good		Good	Either		660	Good	Good	G
		6 weeks	Good		Good	Yes			Good	Good	G
			Fair		Good			720	Good	Good	G
			Good		Good				Good	Good	G
		3 months	Good		Good	Yes		660	Good	Good	G
									Good	Good	G
			Good		Good	Yes		720	Good	Good	G
			Good		Good				Good	Good	G
			Good		Good			660	Good	Good	G
									Good	Good	G
			Good	Float valve, odor	Good	Yes		600	Good	Good	G
			Good			Yes			Good	Good	G
	1		Fair	Thermo, exp. valve	Good	Yes		720	Good	Good	G
	1		Good	Float valve	Good	Yes			Good	Good	G
			Poor		Poor				Fair	Fair	F
	1		Good		Good	Yes		720	Good	Good	G
	1		Good		Good	Yes		720	Good	Good	G
	3		Fair	Leaks	Good	Yes		720	Good	Good	G
	2		Good		Good				Good	Good	G
	2		Good	Float valve	Good	Yes			Good	Good	G
			Fair								
			Good	Float valve	Poor	Yes		720	Good	Good	G
			Fair		Poor				Fair	Good	G
			Poor	Leaks, float valve	Poor				Poor	Poor	P
			Good				Yes		Good	Good	G
							Yes		Good	Good	G
	10		Poor	Factory inspection	Fair			660	Poor	Fair	P
			Good		Fair	Yes			Good	Good	G
								800			
			Fair	Factory inspection	Fair		Yes		Fair	Fair	G
			Fair	Thermo, exp. valve	Fair	Either			Good	Good	G
				C–odor, D-none				800	D-Good	Good	G
	1		Fair	Thermo, right	Good	Yes			Good	Good	G
	2		Good	Leaks	Good		Yes		Fair	Good	G
	12		Poor	Leaks, factory inspection	Good	Yes		800	Poor	Poor	F
	4		Good	Temperature regulation	Good	Yes			Good	Good	G
	12		Poor	Leaks, factory inspection	Fair	Yes		720	Fair	Poor	F
	4		Good	Temperature regulation	Good	Yes			Good	Good	G
			Good	Thermo regulation	Good	Yes			Good	Good	G
	32		Good	Pulley, belt, factory inspection	Fair	Yes		720	Fair	Fair	G
	2		Good	Float valve	Good	Yes			Good	Good	G
			Poor	Odor, leaks				660	Poor	Poor	P
			Good		Fair	Yes			Good	Good	G
			Good	Temperature regulation	Good	Yes			Good	Good	G
		2 months	Good	Thermo regulation	Good	Yes		720	Good	Good	G
			Good	Float valve	Good	Yes			Good	Good	G
			Fair	Leaks, odor, float	Good	Yes			Good	Fair	F
			Good	Noise	Good		Yes		Good	Good	G
			Fair	Leaks	Fair		Yes		Fair	Good	G

[1]Company now sells B only. [2]Central station does not sell refrigerators. [3]The utilities serve separate districts. [4]Represents miscellaneous dealers.
[8]Temporarily discontinued selling. [9]Dealer indifferent. [10]Central station has temporarily discontinued selling r

of Each Selling Outlet Refrigerator Sold			Manufacturer's Dealings with Each Outlet Discount Allowed Per Cent	Relations of Retail Outlet with Refrigerator Manufacturer								Survey Reporter's Impression of Local Outlet Organization
y in fac- e	Operating Performance	Selling Features		Discount	Delivery of Units	Delivery of Repairs	Sales Assistance	Advertising Assistance	Installation and Service	Billing Methods	Handling Time Payments	
d	Good	Good	33	Fair	Good	Fair	Fair	Fair	Poor			Good
d	Good	Good	25	Fair	Good	Good	Good	Good	Good	Good	Good	Good
d	Good	Good	25–33	Good	Fair	Fair	Good	Good	Good	Good		
d	Good	Good	25	Too low	Fair	Fair	Poor	Poor	Poor			Good
r	Good	Good			Good	Good	Fair	Fair	Fair	Good		Fair
												Fair
d	Good	Good	33	Fair	Good	Good	Fair	Fair	Good			Fair
d	Good	Good	25	Too low	Good	Good	Fair	Good	Good		Good	Fair
r	Fair	Fair	35	Too low	Poor	Poor	Poor	Poor	Poor			Poor
			40	Too low								
r	Poor	Good	40	Good	Fair	Fair	Fair	Fair	Good	Good		
d	Good	Good	15	Too low	Good	Good	Good	Good	Good	Good		Good
r	Good	Good	42	Good	Slow	Slow	Good	Fair	Good			Good
												Fair
												Poor
												Fair
d	Good	Good	25	Fair	Good	Good	Good	Good	Good			
d	Good	Good	40	Good	Good	Good	Good	Good		Good		Poor
d	Good	Good	25	Low	Good	Good	Fair	Good	Good	Good		Fair
r	Poor					Poor	Poor		Poor			Fair
												Poor
d	Good	Good	40	Good	Good	Good	Good	Good	Good	Good	Good	
d	Good	Good	40	Low	Good	Good	Fair	Fair		Good		Good
r	Poor	Fair	40	Good	Good	Good	Fair	Fair	Good			Good
d	Good	Good	35	Good	Good	Good	Fair	Fair	Fair	Good		Fair
d	Good	Fair	40	Fair	Poor		Fair	Fair	Good	Good		Fair
												Fair
r	Fair	Fair	40	Fair	Fair	Poor	Fair	Fair	Poor			
d	Good	Good	25	Too low	Good	Good		Good	Good	Good		Good
			25	Too low								Good
												Poor
d	Good	Good	40	Fair	Good	Good	Fair	Good	Good	Good	Good	Poor
d	Good	Fair	40	Too low	Fair	Fair	Poor	Poor	Fair			Good
d	Good	Fair	40	Good	Good	Good	Poor	Poor	Poor			Poor
r	Fair	Fair	40	Too low	Good	Good	Poor	Poor	Poor	Poor		Fair
												Poor
												Poor
d	Good	Good	30	Too low	Good	Good	Fair	Poor	Fair	Poor		Good
d	Good	Good	40	Too low	Good	Good	Poor	Poor	Fair			Good
d	Good	Good	40	Good	Good	Good	Good	Good	Good	Good		Good
r	Fair	Good	42	Good	Good	Fair	Fair	Fair	Good	Good		Good
												Poor
d	Good	Good	12½	Good	Good	Good			Good			Good
r	Good	Good	40	Fair	Poor	Poor	Fair					Good
d	Good	Good	40	Fair	Good	Good	Good	Good	Good	Good	Good	Good
d	Good	Good	30	Fair	Good	Good	Good	Good	Good			Good
d	Good	Fair	35	Fair	Poor		Fair	Fair	Good			Fair
												Poor
r	Fair	Fair	35	Too low	Poor	Poor	Poor	Poor	Poor			Poor
d	Good	Good	30	Fair	Good		Good	Good	Good			Fair
r	Good	Good	40	Fair	Good	Good	Good	Good	Good	Good	Good	Good
d	Good	Good	40	Fair	Good	Good	Fair	Fair	Good	Poor		Fair
d	Good	Good	40	Fair	Good	Good	Fair	Good	Good			Good
d	Good							Good				Good
d	Good	Fair	30	Fair	Good	Good	Fair	Fair	Fair			Poor
												Poor
r	Fair	Good	40	Fair	Good	Poor	Poor	Fair	Poor			Poor
d	Good	Good	33	Fair	Good	Good	Fair	Fair	Good			Good
												Poor
												Poor
d	Good	Good	40	Good	Good	Good	Fair	Fair	Fair	Good		Fair
d	Good	Good	30	Fair	Good	Good	Good	Good	Good			Good
d	Good	Good	33	Fair	Good	Good	Good	Good		Good		Fair
r		Good	40	Fair	Good	Poor	Fair	Fair	Poor			Fair
d	Good	Good	40	Fair	Good		Fair	Fair	Good	Good		Good
d	Good	Good	30	Fair	Good		Good	Good	Good	Good		Fair
d	Good	Good	25	Fair	Good			Good	Good			Fair
r	Fair	Good	40	Fair	Good	Poor	Fair	Fair	Poor			Good
d	Good	Good	25	Low	Good	Good	Good	Good	Good	Good		Good
d	Good	Good	25	Fair	Poor		Fair	Good	Good			Good
d	Good	Good	15	Fair	Good		Good	Good	Good			Good
d	Good	Good		Fair	Good	Good	Good	Fair	Good	Good		Fair
d	Good	Good	30–42	Fair	Good	Fair	Good	Fair	Good			Good
d	Good	Good	30	Fair	Good	Good	Good	Good	Good			Good
d	Good	Good	25–30	Low	Poor	Fair	Fair	Fair	Fair			Fair
d	Good	Good	25	Low	Good	Good	Good	Good	Good	Good		Good
d	Good	Good		Fair	Good	Good	Good	Good	Good			Good
d	Good	Good		Low	Good							Poor
d	Good	Good		Fair	Good	Good	Good	Good	Good	Good		Good
d	Good	Good		Fair	Good		Fair	Good	Good			Fair
d	Good	Good		Fair	Good	Good	Good	Good	Good	Good		Fair
d	Good	Good		Fair	Good			Fair				Fair
d	Good	Good	30–40	Fair	Good	Good	Good	Good	Good			Good[1]
d	Good	Good	30	Fair	Good	Good	Fair	Fair	Good	Good		Fair
d	Good	Good	33	Too low	Good	Fair	Fair	Fair	Fair			Good[3]
d	Good	Good		Good	Good	Good	Good	Good	Good			Good
r	Fair	Fair		Too low	Good	Fair	Poor	Poor	Poor			Poor
d	Good	Good	30	Fair	Good	Good	Good	Good	Good			Good[3]
d	Good	Good	30	Low	Good	Good	Good	Fair	Good			Fair
d	Good	Good	42	Good	Good	Good	Good	Fair	Good			Good
d	Good	Good		Fair	Good		Fair	Good	Good			Fair
d	Good	Good	40	Good	Fair	Good	Good	Good	Good	Good		Good
			42	Good	Fair	Fair	Good	Good	Fair			Good
			25 to 40									Poor[4]
d	Good	Good		Too low	Poor	Fair	Poor	Poor	Fair			Fair[5]
d	Good	Good	25	Too low	Good	Good	Poor	Poor	Fair	Poor		Fair
or	Poor	Fair			Good	Good	Poor	Poor	Poor			Fair
d	Good	Good		Good	Poor		Fair	Fair	Good			Fair
d	Good	Good		Fair	Good							Poor
ir	Poor	Fair	42	Good	Good	Fair	Good	Good	Fair			Poor
d	Good	Good		Good	Fair		Good	Good	Good			Fair
												Fair
												Poor[6]
ir	Good	Fair		Fair	Fair	Fair	Fair	Fair				Poor
				Fair	Fair	Fair	Poor	Poor				Poor[7]
od	Good	Good	40	Too low	Poor	Fair	Poor	Poor	Fair	Poor		Good
od	Good	Good	40	Fair	Good							Poor[8]
od	Good	Good	40	Fair	Fair	Fair	Poor	Poor	Fair	Poor		Fair
od	Good	Good		Low	Good	Fair	Fair	Fair	Fair			Fair
												Poor[9]
or	Fair	Good	40	Good	Good	Fair	Fair	Fair	Good			Good
od	Good	Good	30	Good	Good		Good	Good	Good			Fair
												Fair
or	Fair	Good	42	Fair	Fair	Good	Good	Good	Fair			Fair
od	Good	Good		Fair	Good	Good	Good	Good	Good		Good	Good
od	Good	Good	25	Fair	Good	Fair	Fair	Fair	Good			Good
ir	Good	Fair	30	Low	Fair	Fair	Poor	Poor	Fair			Good
od	Good	Good	25	Too low	Good	Good	Good	Good	Good		Expensive	Fair
or	Poor	Poor										Poor[10]
od	Good	Good		Fair	Poor	Fair	Good	Good	Good			Fair
od	Good	Good		Fair	Good	Good	Fair	Fair	Good			Fair
												[11]
od	Good	Good	10	Fair	Good	Good	Fair	Poor	Fair			Fair
od	Good	Good	40	Good	Good	Good	Good	Good	Good			Good
ir	Fair	Good	40	Fair	Good	Good	Good	Fair	Good			Good
od	Good	Good	35	Fair	Poor	Good	Fair	Fair	Good			Fair
od	Good	Fair	25	Low	Fair	Good	Poor	Poor	Fair			Fair
			25–40									

dealers. [5]Central station does not sell refrigerators. [6]Central station does not sell. [7]None of these dealers could give any data.
ed selling refrigerators. [11]These dealers doing very little and had no comment to make.

Locality	Approximate Number of Domestic Customers	Number of Electric Refrigerators				Central-Station Executive Reaction to Electric Refrigeration	Relations With Ice Industry	Total Number Electric Refrigerator Selling Outlets	Total Number Electric Refrigerator Salesmen	Local Selling Out	
		On Lines	Commercial	Domestic	Total Estimated Sales For 1927					Make	Type of Dealer
1	16,000	250	100	150	500	Good	Good	3	..	A B C	Cent. sta. Spl. dealer Spl. dealer
2	5,000	65	25	40	100	Poor	Fair	2	..	B C	Spl. dealer Spl. dealer
3	75,000	800	300	500	1,700	Good	Good	6	..	C B A	Cent. sta. Spl. dealer Furn. dealer
4	3,500	40	10	30	75	Fair	.....	4	..	D B A F	Cent. sta. Spl. dealer Mus. dealer Radio dealer
5	9,000	200	100	100	250	Fair	Good	3	..	C B A	Cent. sta. Spl. dealer Furn. store
6	50,000	1,350	250	1,100	2,700	Good	Good	6	..	C B A S	Cent. sta. Spl. dealer Spl. dealer Hdw. dealer
7	3,500	150	50	100	425	Fair	Good	4	..	(C-D-5A-B-A) A B C	Cent. sta. Hdw. dealer Spl. dealer Elect. dealer
8	5,000	285	35	250	350	Good	Good	4	..	C B A	Cent. sta. Spl. dealer Auto supply
9	5,000	130	50	80	250	Fair	.....	3	..	B C A	Elect. dealer Elect. dealer Auto. dealer
10	14,000	600	200	400	700	Fair	Good	5	..	C A B	Spl. dealer Factory br'ch. Spl. dealer
11	150,000	1,900	400	1,500	1,000	Fair	Good	5	..	A B C	Furn. dealer Distrib. dealer Distrib. dealer
12	7,500	300	50	250	300	Poor	Good	6	..	A C 5-A B	Fixt. dealer Furn. dealer Elect. contr. Spl. dealer
13	2,000	165	40	125	100	Fair	Good	1	..	B	Spl. dealer
14	12,000	450	150	300	300	Fair	Good	..	..	B	Distrib. dealer
15	14,000	550	200	350	350	Poor	Poor	..	..	C B	Distrib. dealer Distrib. dealer
16	2,200	30	10	20	115	Fair	Fair	2	..	D A B	Elect. dealer Elect. dealer Spl. dealer
17	3,800	60	20	40	100	Fair	O. K.	5	..	C 5-A F B	Cent. sta. Furn. dealer Elect. dealer Elect. dealer
18	35,000	350	100	250	350	Good	Good	3	..	C A B	Cent. sta. Elect. dealer Spl. dealer
19	80,000	1,400	400	1,000	700	Fair	Good	8	..	C 5-A C B A	First cent. sta. Second cent. sta. Distrib. dealer Elect. dealer Ice dealer
20	2,000	33	18	15	75	Fair	Good	..	..	5A, C	Cent. sta.
21	3,000	15	5	10	90	Fair	Good	2	..	C	Cent. sta.
22	27,000	125	50	75	200	Poor	Good	4	..	B	Spl. dealer
23	75,000	500 est.	200	300	500	Fair	Good	6	..	C A B 5-A F	Cent. sta. Elect. dealer Spl. dealer
24	4,800	45	5	40	80	Fair	Good	2	..	5-A B	Cent. sta. Elect. dealer
25	30,000	350	50	300	500	Good	Good	5	..	5-A B A F S	Cent. sta. Spl. dealer Ice dealer Elect. dealer Hdw. dealer

Selling Outlets			Number Units Sold, Jan. 1–Aug. 15, 1926			Sales Estimate for 1927		Selling Method Used			Sales Plan			Special Training for Salesmen
e of aler	Number in Sales Staff	Time in Refrigerator Business Years Mos.	Commercial	Domestic	Per Cent Remote	Commercial	Domestic	Resale Plan	Special Men	General Sales Force	Continuous	Continuous and Campaign	Seasonal	
. sta.	4	1 6	.....	60	.....	.....	200	.....	4	.....	Yes	.....	.....	Sales and service sch
dealer	..		40	40	.....	70	80	.....	Yes	.....	Yes	.....	.....	.....
dealer	..	6	1	14	.....	.....	150	.....	Yes	.....	.....	.....	.....	.....
dealer	..		7	6	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		2	10	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....
. sta.	6	1	.....	135	50	.....	500	.....	Yes	.....	.....	Yes	.....	Local sales schools
dealer	5		100	200	50	200	500	.....	Yes	.....	Yes	.....	.....	.....
dealer	..	6	.....	33	.....	.....	500	.....	Yes	.....	Yes	.....	.....	.....
. sta.	..	6	.....	8	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		5	4	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	.....
dealer	..	2	.....	10	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
. sta.	..	9	40	35	.....	.....	50	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		48	12	.....	50	50	.....	Yes	.....	Yes	.....	.....	Sales schools
store	..		.....	35	.....	.....	100	.....	.....	.....	.....	.....	.....	.....
. sta.	7	2	.....	250	2	.....	1.000	.....	Yes	.....	.....	Yes	.....	Sales school
dealer	12	6	75	200	80	200	600	.....	Yes	.....	Yes	.....	.....	Sales school
dealer	7		.....	375	.....	.....	775	.....	Yes	.....	Yes	.....	.....	.....
dealer	..		.....	67	.....	.....	125	.....	.....	Yes	Yes	.....	.....	.....
. sta.	..		.....	18	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	Sales schools
dealer	..	2	.....	5	.....	.....	.....	.....	.....	Yes	.....	.....	.....	.....
dealer	..	3	35	40	.....	100	125	.....	Yes	.....	Yes	.....	.....	3 weeks
dealer	..	1	.....	15	.....	.....	200	.....	.....	Yes	Yes	.....	.....	.....
. sta.	..		8	67	.....	18	130	.....	One	Yes	.....	Yes	.....	.....
dealer	4		20	115	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	2 weeks
supply	..	6	.....	60	.....	.....	180	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		40	60	.....	75	100	.....	Yes	.....	Yes	.....	.....	.....
dealer	..		.....	1	.....	.....	50	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		.....	6	.....	.....	25	.....	.....	.....	.....	.....	.....	.....
dealer	..	3 6	20	235	25	.....	200	.....	Yes	.....	Yes	.....	.....	.....
ry br'ch.	..	3	.....	20	.....	.....	50	.....	Yes	.....	Yes	.....	.....	.....
dealer	5		100	100	50	100	350	.....	Yes	.....	Yes	.....	.....	.....
dealer	4	5	.....	300	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	.....
. dealer	..		200	500	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	Local sales school
. dealer	..	3	50	250	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	.....
dealer	..	2	.....	5	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	Special men needed
dealer	..		.....	30	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	Sales schools
contr.	..	1 1	.....	20	.....	.....	50	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		25	90	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	Sales schools
dealer	..	3	25	75	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	4 days
. dealer	7		.....	.....	75	.....	.....	.....	Yes	.....	Yes	.....	.....	Special schools
. dealer	..		.....	.....	50	.....	.....	.....	Yes	.....	Yes	.....	.....	Special schools
. dealer	..		.....	.....	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	Sales schools
dealer	..	1	.....	1	.....	.....	25	.....	.....	Yes	Yes	.....	.....	.....
dealer	..	2	1	1	.....	.....	25	.....	.....	Yes	Yes	.....	.....	.....
dealer	..	6	5	6	.....	.....	50	.....	Yes	.....	.....	.....	Yes	.....
. sta.	..	6	.....	5	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	Man. rep. instructs
dealer	..	3	.....	5	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	Sales schools
dealer	..	6	.....	.....	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
dealer	..		10	20	50	.....	.....	.....	Yes	.....	Yes	.....	.....	.....
. sta.	..		40	76	.....	.....	.....	.....	Yes	Yes	.....	Yes	.....	Sales schools
dealer	1	4	.....	50	.....	.....	150	.....	Yes	.....	Yes	.....	.....	Sales schools
dealer	..		20	6	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
ent. sta.	3	3	.....	70	50	.....	.....	.....	Yes	.....	Yes	.....	.....	Trained by factory r
cent. sta.	4		.....	450	.....	.....	300	.....	Yes	Yes	Yes	.....	.....	Week
. dealer	6		.....	74	50	.....	200	.....	Yes	.....	Yes	.....	.....	.....
dealer	..	3	75	200	50	.....	200	.....	Yes	.....	Yes	.....	.....	Sales schools
dealer	..	2	.....	75	50	.....	.....	.....	Yes	.....	Yes	.....	.....	Sales schools
. sta.	..	5	.....	10	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	1 lecture by factory
. sta.	..	6	.....	2	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
dealer	1		20	35	.....	.....	.....	.....	Yes	.....	Yes	.....	.....	.....
. sta.	..	6	.....	50	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	1 lecture by factory r
dealer	..		.....	25	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
dealer	Oil bu	No interview but rner & refrig. just start Represented but active		very act ing with	ive dealer refrigerat	or			D—	represent	ed but n	ot active		
. sta.	..		1	17	95	.....	.....	.....	.....	Yes	Yes	.....	.....	Sales schools
dealer	..	3	.....	7	.....	.....	.....	.....	.....	Yes	Yes	.....	.....	.....
. sta.	..		.....	100	75	.....	200	.....	Yes	.....	Yes	.....	.....	.....
dealer	..		.....	.....	.....	.....	200	.....	Yes	.....	Yes	.....	.....	Sales schools
dealer	..	Just starting	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
dealer	..	Just starting	.....	.....	.....	.....	100	.....	.....	.....	.....	.....	.....	.....
dealer	..	Just starting	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

Western States Continued on Pages 11 and 12

Compensation of Salesmen		Dealings with User of Refrigerator				Financing Time Payments	
Method	Commission Per Cent	Installation Charge	Length of Time Payment. Months	Discount for Cash	Free Service Period	Local	Manu-facturer
Salary			18		1 year	Local	
Commission					1 year		Mfr.
			12–18		1 year		
Commission							
Commission			18		1 year	Local	
Commission					1 year		Mfr.
Commission							
Commission			12	10%		Local	
Commission			12		1 year		Mfr.
						Local	
ry and commission			10%–18 mo.	7%	Yes	Local	
							Mfr.
ry and commission			12–18–24		Continuous	Local	
Commission					Continuous		Mfr.
						Local	
			24			Local	
Salary	$100+$10 per machine		24		1 year	Local	
			18		1 year	Local	
Commission	10%		12		1 year	Local	
Commission					1 year	Local	
lary and commission			6–18		1 year	Local	
Commission			12		1 year		Mfr.
Commission						Local	
					1 year		
						Local	
					1 year	Local	
						Local	
Commission					6 months		Mfr.
Commission			12		†	Local	
$100+10%					6 months		Mfr.
Commission	15%				1 year	Local	
						Local	
						Local	
Commission			12–18		1 year	Local	
					1 year		Mfr.
Commission			1 year				Mfr.
week + 5% or 15% straight			1 year				
5/mo. $25/sale over 5; $10/cash sale $5/12 mo. contr.			12–18		1 year	Local	
			12–18				Mfr.
						Local	
Commission					1 year	Local	
					1 year		Mfr.
					1 year	Local	
Commission						Local	
Commission					1 year	Local	
Commission						Local	
Salary		$16	18		1 year	Local	
			12–18		Continuous	Local	
Salary			10%–18 mo.		1 year	Local	
Commission			10%–5%		1 year	Local	
			25%–18 mo.		1 year	Local	
Commission			1/12 mo.		1 year		Mfr.
					1 year	Local	
rep.			10%–12–24		1 year	Local	
						Local	
Commission			1/12		1 year		Mfr.
Commission			20%–12 mo.		1 year	Local	
Commission			12–18		1 year	Local	
			10%–18 mo.		1 year	Local	
					1 year		
Salary and commission						Local	
Commission			1/12		1 year		Mfr.

† Contract 3 months; give year

ts	Sales Resistances Encountered			Relations Among Local Outfits			Servicing Method			Special Training for Service Men
	First Cost	Anticipation of Price Reduction	Unconvinced of Final Development	Price-Cutting Claims	Unethical Sales Methods	Central-Station Unfair	Number of Men	Manufacturer's Branch	Own Force	
i-er	Yes			No	No		1		Yes	Special school
	Yes			Yes					Yes	
	Yes								Yes	
	Yes		Yes	No	No	No			Yes	
			Yes						Yes	
	Yes	Yes	Yes	Yes			1		Yes	
r.	Yes			Yes					Yes	
						No			Yes	
	Yes			No	No					
r.	Yes								Yes	
	Yes			No	No	No		Yes		
	Yes		Yes	No					Yes	
r.	Yes						1		Yes	
									Yes	
	Yes		Yes	No		Yes			Yes	Factory rep. help
r.	Yes				Yes	Yes	8		Yes	
	Yes	Yes	Yes		Yes	Yes	2		Yes	
	Yes		Yes		Yes	Yes	1		Yes	
	Yes		Yes	Yes	Yes				Yes	1 month
	Yes					Yes	1		Yes	
	Yes	Yes			Yes	Yes			Yes	1 month
	Yes			Yes	Yes	Yes	1		Yes	
							2		Yes	
r.	Yes	Yes	Yes		Yes	Yes	5		Yes	
				No	No	No			Yes	1 month
	Yes			No	No				Yes	
		Yes								
	Yes								Yes	
	Yes			No	No				Yes	
	Yes			No					Yes	
r.	Yes			No			8		Yes	1 month
	Yes			No	No	Very fair	3		Yes	
fr.	Yes			Very noticeable	Yes	No			Yes	1 month
	Yes			Very noticeable	Yes	No			Yes	
	Yes						1		Yes	
	Yes			Discounts to builders	Yes		1		Yes	
				Yes			1		Yes	
fr.	Yes			Yes	Yes		2		Yes	1 month
fr.			More educa. need				2		Yes	1 month
	Yes		Yes						Yes	1 month
	Yes								Yes	1 month
fr.	Yes								Yes	1 month
	Emph. yes								Yes	
	Yes		Yes						Yes	
fr.	Yes		Yes					Yes		1 month
	Yes						1		Yes	Factory for month
	Yes		Yes				1		Yes	
	Yes		Yes	Yes	Yes		1		Yes	
	Yes		Yes				2		Yes	1 month
	Yes					Very fair	1		Yes	
	Yes	Yes	Yes	Yes	Yes		2		Yes	1 week
	Yes	Yes	Yes	Yes	Yes		2		Yes	
	Yes	Yes	Yes	Yes	Yes				Yes	
Mfr.	Yes			Yes	Yes	Yes			Yes	
	Yes						1		Yes	1 week
			Yes						Yes	
Mfr.	Yes						1		Yes	
			Yes					Yes		
	Ice not in general use in this sec.								Yes	
	Yes						1		Yes	10 days
		Yes					1		Yes	
								Yes		
Mfr.	Yes									

Western States Continued on Page 12

Servicing Experience of Each Outlet					Manufacturer's Service on Repair	Type of Unit Advocated for Home		Kw.-Hr. per Unit per Year	Satisfaction with K	
Yearly Cost per Unit	Number Service Calls per Year	Frequency of Periodic Inspection	Ease of Repair	Complaints		Remote	Self-Contained		Mechanical Construction	Quality Manufacture
		Quarterly		Thermo, exp. valves, belts, noise	Good	Yes			Good	Good
						Yes			Good	Good
	2			Poor factory inspection		Yes			Fair	Fair
			Fair	Poor operation	Fair				Poor	Poor
			Fair	General operation poor, leaks, odor	Fair	Yes			Poor	Very p
			Good	Very little trouble		Yes			Good	Good
				Very little trouble					Good	Good
									Good	Good
			Good	Very little trouble	Good	Yes			Good	Good
					Good	Yes			Good	Good
$19–54	10			Poor operation, leaks, odor	Poor				Poor	Poor
				Very little trouble	Good					
				Very little trouble					Good	Good
Excessive			Fair	Poor operation, leaks, odor	Fair		Yes		Poor	Poor
				Very little service		Yes			Good	Good
				Very little service	Good				Good	Good
				Very little service		Yes			Good	Good
$17.20	1.47	Directly after instal.		General	Fair	Yes			Good	Good
									Fair	Fair
+ ins. 2½%	1			Very little trouble	Good	Yes			Good	Good
	Excessive			Float valves	Good	Yes			Fair	Poor
	8.4			Belts, leaks, noise	Good	Yes			Fair	Fair
				Very little trouble	Good	Yes			Good	Good
				Leaks due to poor installation		Yes			Good	Good
				Very little service		Yes			Good	Good
				Service costs too high	Good	Yes			Fair	Fair
				No complaints						
									Good	Good
7%		Often during first 3 mo.		Very little trouble	Good	Yes			Good	Good
				Very little trouble	Good				Good	Good
					Good	Yes			Fair	Fair
									Good	Good
				Odors, leaks		Yes			Good	Good
						Yes			Good	Good
									Good	Good
				Very little trouble		Yes			Good	Good
$20–25				Valve float, belts, leaks	Good	Yes			Fair	Fair
				Poor oper. due to high climatic temp.					Good	Good
									Good	Good
						Yes			Good	Good
						Yes			Good	Good
				Odor in box	Good	Yes			Good	Good
									Good	Good
						Yes			Good	Good
									Good	Good
Too high		Monthly		Leaks, odor, poor insp., poor paint	Good		Yes		Poor	Poor
				Very satisfactory	Fair	Yes			Good	Good
				Blind gaskets, leaks, poor inspection	Good	Yes		900	Fair	Fair
				Expansion valves, leaks	Good	Yes			Good	Good
				Too much service		Yes			Good	Good
				Very little service	Good	Yes			Good	Good
	1			Leak, odor on "C"	Good		Yes		Fair	Fair
				Poor operation		Yes			Fair	Fair
				Very little service	Good	Yes			Good	Good
						Yes		600	Good	Good
				Very little service					Good	Good
At factory				Expansion valves, noise	Good	Yes			Good	Good
				Very little service	Good		Yes		Good	Good
				Expansion valves, belts, leaks	Good	Yes			Good	Good
					Good	Yes			Good	Good

[1]Central station does not merchandise refrigerators. [2]F-G-C dealers not very active. [3]F in department store; N also represented; neither very active.
[9]Central station does not merchandise. [10]N dealer failed; F and S not important dealers. [11]Central station does not merchandise.
[15]Other dealers not important. [16]Other dealer not important. [17]Handles, but does not feature D.
[20]5-A in other central stations operating in this city—not active. [21]A-C-5

tisfaction of Each Selling Outlet with Refrigerator Sold			Manufacturer's Dealings with Each Outlet Discount Allowed Per Cent	Relations of Retail Outlet with Refrigeration Manufacturer								Survey Reports Impressions of Local Outlet Organizations
Quality in Manufacture	Operating Performance	Selling Features		Discount	Delivery of Units	Delivery of Repairs	Sales Assistance	Advertising Assistance	Installation and Service	Billing Methods	Handling Time Payments	
Good	Good	Good			Good	Good	Good	Fair	Good			Fair
Good	Good	Good			Good	Good	Good	Good	Good			Good
			42	Good				Fair				Fair
Fair	Fair	Fair		Poor	Poor	Poor	Poor	Fair	Fair			Poor
Poor	Fair	Fair	42	Good	Fair	Fair	Fair	Fair	Fair			Poor[1]
Very poor	Poor	Fair	42	Good	Good	Fair	Fair	Fair	Good			Fair
Good	Good	Good		Fair	Good	Good	Good	Good				Good
Good	Good	Good		Fair								Fair[2]
Good	Good			Good	Poor							Fair
Good	Good	Good	20	Poor	Poor		Fair	Fair	Good			Fair
Good	Good	Good	30	Fair	Poor	Fair	Fair	Fair	Fair			Fair
			30	Poor								Poor
Poor	Poor			Fair								Fair
Good	Good	Good										Fair
Poor	Poor	Fair	42	Good	Good	Fair	Fair	Fair	Fair			Fair
Good	Good	Good					Good	Good	Good			Good
Good	Good	Good		Good	Good	Good	Good	Fair	Good			Good
Good	Good	Good	20	Poor			Fair	Fair				Poor[3]
Good	Good	Good		Fair	Good	Fair	Fair	Fair				Fair[4]
Fair	Fair											Poor
Good	Good	Good		Good	Good	Good	Good	Good				Good
Poor	Fair	Fair	42	Good								Fair
Fair	Fair	Fair		Good	Good	Good	Fair	Fair	Fair			Fair
Good	Good	Good		Fair	Good	Good	Good	Good				Good
												Poor[5]
Good	Good	Good		Poor	Good	Good	Good	Good				Fair
												Poor
Good	Good	Good		Good	Good	Good	Good	Good				Poor[6]
Fair	Fair	Good		Fair	Good	Good	Fair	Fair	Good			Fair[7]
					Good	Good	Good	Good	Good			Fair
Good	Good	Good		Good	Good	Good	Good	Good	Good			Good[8]
Good	Good	Good	37	Good	Good	Good	Fair	Good				Good[9]
Good	Good	Good		Fair	Good	Good	Good	Good				Good
Fair	Fair	Good	42	Fair	Good	Good	Fair	Fair				Fair[10]
Good	Good	Good										Poor[11]
Good	Good	Good		Good	Good	Good	Fair	Fair				Fair[12]
												Poor[13]
Good	Good	Good		Good	Good	Good	Good	Good				Good
Good	Good	Good		Fair	Fair	Fair	Fair	Good				Good[14]
Good	Good	Good		Fair	Fair	Fair	Good	Good				Good[15]
Fair	Poor	Fair		Good	Good	Good	Good	Fair				Fair
Good	Good	Good		Fair	Fair	Fair	Good	Good				Good[16]
Good	Good	Good			Poor							Fair
Good	Good	Good										Fair
Good	Good	Good			Poor							Fair
Good	Good	Good										Poor[17]
Good	Good	Good										Fair
Good	Good	Good		Good								Poor
Good	Good	Good										Poor[18]
Poor	Fair	Fair	40	Good	Good	Good	Fair	Fair				Fair
Good	Good	Good		Good	Fair	Fair	Poor	Poor	Fair			Fair
Fair	Fair	Fair		Good	Good	Good	Poor	Poor				Fair
Good	Good	Good		Good	Good	Good	Poor	Fair	Good			Poor
Good	Good	Good										Fair
Good	Good	Good		Poor	Poor							Good
												Fair[19]
Fair	Fair	Fair		Good	Good	Good	Poor	Fair				Fair
Fair	Fair	Fair										Poor[20]
Good	Good	Good		Good								Poor[21]
Good	Good	Good		Good								Poor[22]
Good	Good	Good		Fair	Good							Fair
Good	Good	Good		Good	Good	Good	Fair	Fair				Fair
Good	Good	Good		Good	Good	Good	Good	Good				Good
Good	Good	Good		Fair	Good	Good	Good	Good				Fair

[1]Features B. [2]F just starting. [3]Central station does not merchandise. [4]Central station does not merchandise. [5]F and G just starting.
[6]Central station does not merchandise. [7]N and G represented. [8]N and G represented, but not important dealers. [9]Central station does not merchandise.
[10]Feature D. [11]A represented but not active. [12]F, G and local manufacturers represented—not active.
[13]A-C-5A represented, but not active. [14]C also sold by distributor.

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The Attack on the Holding Company

THE necessity of publicity and of an informed public opinion is very apparent in the case of the holding company. Here is an instrumentality, possessing obvious advantages and capable of much good, damned because it is not understood or properly comprehended. Obviously the fault rests with the holding companies themselves, but it would ill become the electric light and power industry to play the part of the Levite and pass the attack by unnoticed. Much of the holding-company mess—and it is a mess—is attributable to the rapid growth of the electric light and power industry, the leaders deeming it more important, and rightly so, to expand facilities first and clean up corporate structures afterward. This situation will right itself in time. But the source of irritation lies in a different direction.

The electric light and power industry is having one of its unwilled but periodic attacks of interference by speculators—men who possess none of the spirit, recognize none of the traditions and are not part and parcel of the industry, but who are privileged to buy its stocks and bonds—and sometimes control—in the open market and who have exercised that right. These people have no mind to develop and distribute equitably the advantages of consolidation or of interconnections. Their interest is ended when they close their account with their broker and get out of the market. Those of them who reckon that they can get their money out of the market and still sit in the game are the worst troublemakers of the lot—that is to say, the groups who sell on plausible representation enough securities to insure themselves against loss (or more likely to make a good profit) and still keep control through voting stock.

The industry had just such individuals to contend with thirty years ago. Some of them repented; others are dead, and still others reaped what was coming to them in the way of economic punishment. But the industry of thirty years ago was insignificant compared with the industry of today, and public interest was infinitesimal then instead of universal as it is at present. Nor is it so easy now to separate the sheep from the goats; because one group merges into the other, which is to say that some sheep have quite long hair and curly horns, not to speak of cloven hoofs. The usual history of these periods of selling stock to investors which should be sold only to speculators who know they are speculating is that there is a smash or two, that the speculators run to cover, and that after a period of time the mess is cleaned up in the best way possible by the honest men concerned. What is to be hoped is that the smash, if it comes, will be on a small scale; for there was evidence enough last March of the possibilities.

As to the remedy, it is questionable whether much good will be served by legislation except such as is inevitable, and that will define the relations of the holding companies to the subsidiaries. A lot of such legislation is certain to be amateurish and will have the fault of being inconsistent in different states. That does not mean, however, that congressional legislation would be any less amateurish or any more consistent. As for congressional investigations, the country is pretty sick of them, because they consume much time and usually get nowhere. Much more would be accomplished if the executive branch of the government would exert itself and if the electric light and power industry, in defense of its good name and splendid record, would set up a code of ethics and ostracize those who refused to adhere to it.

Facts Versus Opinions in Plant Maintenance

YEAR after year the pressure upon operating engineers to achieve greater mastery of plant and equipment increases. The causes are in the last analysis economic. Progress in this direction demands foresight based upon skilled engineering judgment, and judgment requires accurate knowledge of conditions if sound decisions are to be reached. Opinions may be useful to a degree, but facts about plant and apparatus performance, status and outlook command chief respect.

In the field of maintenance the need of definite information is steadily growing. Modern electric light and power installations are commercial enterprises, and even though they contain new and untried elements, they are not experimental in any large sense. The time is now here for more thoroughly studying the whole maintenance problem, for co-ordinating experience and interchanging ideas and data in order that the unknown quantities may be lessened in number and value. Formerly the rapid growth of systems left little opportunity for what might be called the scientific study of maintenance, at least in many properties.

How shall this technique be attained in the utility industry? Not a few companies have begun to find the answer in more systematic records of inspection and repair work, combined with earnest study of these in relation to service results. There is more to the matter, however, than setting up a routine periodic examination of plant and equipment and checking off the different items every so often as the inspecting staff goes the rounds of the property. It is a truism to say that maintenance work should not be done until it is necessary, but what is the touchstone of this need? In a word, it is co-ordination of inspection and repair work with operating experience; it is the searching analysis of plant by which the engineer obtains facts and figures to take the place of opinions that this or that job should be undertaken at a stated interval or date. Fortified by such data, the safe lim-

its of deferred maintenance may be approximated, the factor of guesswork will be cut down, and an able course can be steered between the Scylla of neglect and the Charybdis of extravagance. For it is possible to waste money in maintenance no less than in construction, and the proper saving of money should never be lost from sight by the engineer through fascinated absorption in technicalities.

The Independent Jobber and the Electrical Supply Jobbers' Association

WIDE discussion of the economic status and the "political" situation of the independent jobber characterized the annual winter convention of the Electrical Supply Jobbers' Association at Atlantic City last week. The term "independent jobber" in prevailing parlance indicates the house that is not affiliated in any way with the General Electric, the Westinghouse or the Graybar group of distributors. The number of these "independents" has been appreciably thinned in recent years because of the many prominent jobbers who have joined the families of the two large electrical manufacturers, but there remain some fifty-odd of the "free-lance" members, who have formed a somewhat discontented minority.

It is inevitable that the small distributor operating "on his own" should look with anxiety upon the competition of those members of the three large groups who may be operating in his territory. In his eyes they stand for power. And he forgets that just as when a few independents talk together they discuss their fear of the big groups, so do the members of these large distributing systems when they foregather discuss their fear of the too often uneconomic competition of the "uncontrollable independent." Frankly, the General Electric distributor, the Westinghouse agent-jobber and the Graybar branch house have certain advantages over the small independent. By affiliation they have secured for themselves definite practical resources of co-operation such as in leadership, financing, publicity, cost knowledge and market information; but they have obviously sacrificed certain other advantages of freedom, mobility and economy which have always been and ever will be the defense of the small organization against the great. If by holding a separate group meeting of the "independent" members of the E.S.J.A. before each general meeting of the association the independents can acquire for themselves some of these added resources of group affiliation, it will be clear gain for them and for all. Improve the ethics and the economics of any group and the entire industry naturally benefits.

There is unquestionably need for a larger membership of independent jobbers in the national association of electrical distributors. The independent manufacturer can do no greater service to his distributors and to himself then to urge all the independent jobbers whom he supplies to join, now that it has been made easier and more inviting. The E.S.J.A. through its committee work has done much for progress in the electrical industry, but there are many problems of distribution that right now cry out for solution. An expanded and inclusive membership in this association under enterprising and purposeful leadership is one of the opportunities of the hour.

Taxation and Public Service

THE light and power industry has always been glad to pay taxes. It pays nearly 7½ per cent of its gross earnings in the shape of imposts to support the government, and it has long announced a policy of willingness to do more than its share in support of American institutions. This attitude has created public good will and is good business.

An article in the financial department of this issue shows that the light and power industry contributes a relatively higher proportion of its earnings for taxes than any other branch of industry or trade. It is relatively greater also than that paid by any other type of public utility. These data show that light and power leaders would be justified in calling for a readjustment of the tax assessments that would bring them more closely in line with those of other utilities and corporate enterprises. They show that the industry pays a disproportionately large sum to the public for the privilege of rendering public service.

The light and power industry, let it be repeated, has never objected to paying its share of taxes and has not even objected to the inequitable distribution of the tax burden. But it has failed to inform the public fully of what it contributes to the national tax bill or what its tax burden is in comparison with those of other enterprises. It would seem well worth while to tell the tax story to the public.

The Industry Conference on Wiring

THE Industry Conference on Wiring has held its first meeting and is at work on the solution of the problem that has been brought before it, which is an outgrowth of the controversy that has arisen between the power companies and the electrical contractors as to the influence of present trends in wiring practice upon the development of the electrical market.

The immediate issue is clear-cut. Is the all-metal standard of wiring normally more expensive than other wiring methods? And—whether more costly or not—is it exercising a restraint upon the development of the electrical market in communities where "all metal" is enforced by ordinance? The supporting facts are being marshaled, and the conference should sift the evidence, investigate conditions in the field, reach a conclusion and publish it. If any other remediable influence is discovered that is impeding the adequate wiring of homes, the conference should report that too, so that all the industry may know what is in the common interest. When this is done, then comes the real opportunity before this conference—to point out to all concerned, once they are in agreement as to the status and the trend of wiring, how the industry may best advance the work of adequately equipping the homes of America for the complete utilization of electric service. The introduction of more outlets into the great proportion of the homes now using electricity, the rewiring and refixturing of countless obsolete installations and the more generous provision of electrical facilities in all new-built houses—these are the objectives for the years immediately ahead in the field of wiring. And if this conference can focus the attention of the four major branches of the industry upon their common purpose in this direction the effort will not have been in vain.

Electric Refrigeration

Present and Future

UPWARD of a quarter of a million electric refrigerators—domestic and small commercial units—will be sold in the United States during the calendar year 1926. These, together with the ones already in use, will bring the total number connected to the lines of the power companies to about four hundred thousand. The existing retail refrigerator outlets—central-station companies, special dealers, distributors and others—variously estimate their next year's sales at from two to three times those of this year, or between a half and three-quarters of a million units. Manufacturers' production quotas total considerably more than these figures, but the aggregate volume of sales next year will be governed by a number of factors enumerated in detail in the survey of electric refrigeration published in this issue of the ELECTRICAL WORLD.

There is no doubt of the market possibilities for this device. Utility executives believe that from 10 to 30 per cent of their residential customers may be considered legitimate "prospects" for refrigerators at existing prices and at the present stage of development. The highest average saturation of domestic customers attained in any section of the country is 2.41 per cent, while the average for the country as a whole is only 1.78 per cent. If, however, dealers' sales estimates and manufacturers' production quotas for the year 1927 are to be realized, the development of electric refrigeration involves something more than estimating market possibilities, setting quotas and figuring the revenue from energy consumption or merchandising profit. Out of the mass of specific data, information and opinion gathered in the survey appear many factors which will affect the electric refrigeration business next year. Of these several conspicuously important elements may be set down as vital. They may be thus enumerated:

1. Manufacturers should turn out consistently high-standard equipment as nearly perfect in mechanical construction and final inspection as present-day facilities will permit. Deliveries of units and shipments of repair parts should be expedited, but in no case should quality be sacrificed for production.

2. Distributors should recognize and assume their responsibility as liaison officers between the manufacturer and the retail outlet, transmitting to dealers the installation, sales and service assistance which is particularly necessary in promoting the sale of relatively so new a device as the electric refrigerator.

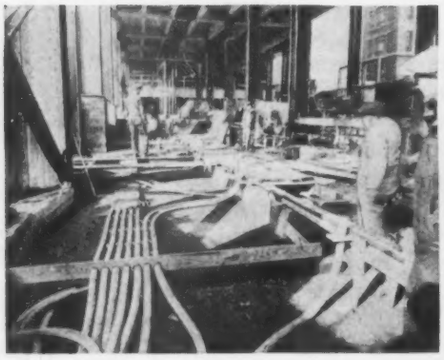
3. Central-station companies and all other dealers must recognize that the electric refrigeration business is highly specialized and that hit-or-miss methods in sales, installation or service carry heavy penalties in an aftermath of complaints, dissatisfaction and high servicing costs, 95 per cent of which could have been eliminated had care been taken at the start to see that salesmen, installation crews and service men were sufficiently trained.

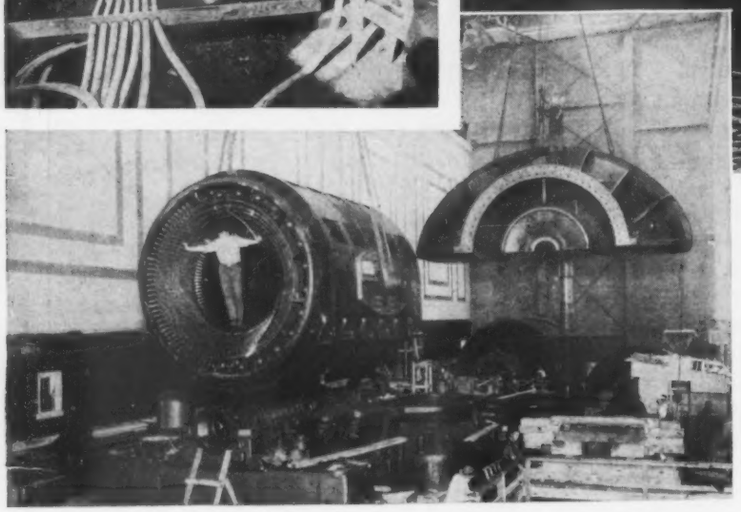
4. Granted that refrigerators will be of a uniformly high standard of manufacture and that deliveries will be prompt, there remains the problem of assembling adequate man power for selling, installing and servicing. These combine to form the neck of the bottle through which manufacturers' production must be squeezed to reach the at present unlimited market. Organization and training cannot be overdone if quotas are to be reached next year.

5. All engaged in electric refrigeration should be constructive in their attitude. Criticism of the machines, refrigerants or mechanical details of the product of competitors by salesmen or users reacts badly on a national policy of building the idea of electric refrigeration in the minds of the public.

Fundamentally the electric refrigerators now on the market are satisfactory when properly made, inspected and installed. Comparatively little fault has been found with their design, and general acceptance has increased enormously in the last year, but the public still wants to be "shown." Whether in electric refrigeration next year and the years that follow are to be years of realization or years of disappointment will depend upon the extent to which this year's experiences are capitalized.

Handling Heavy Equipment for East River Station



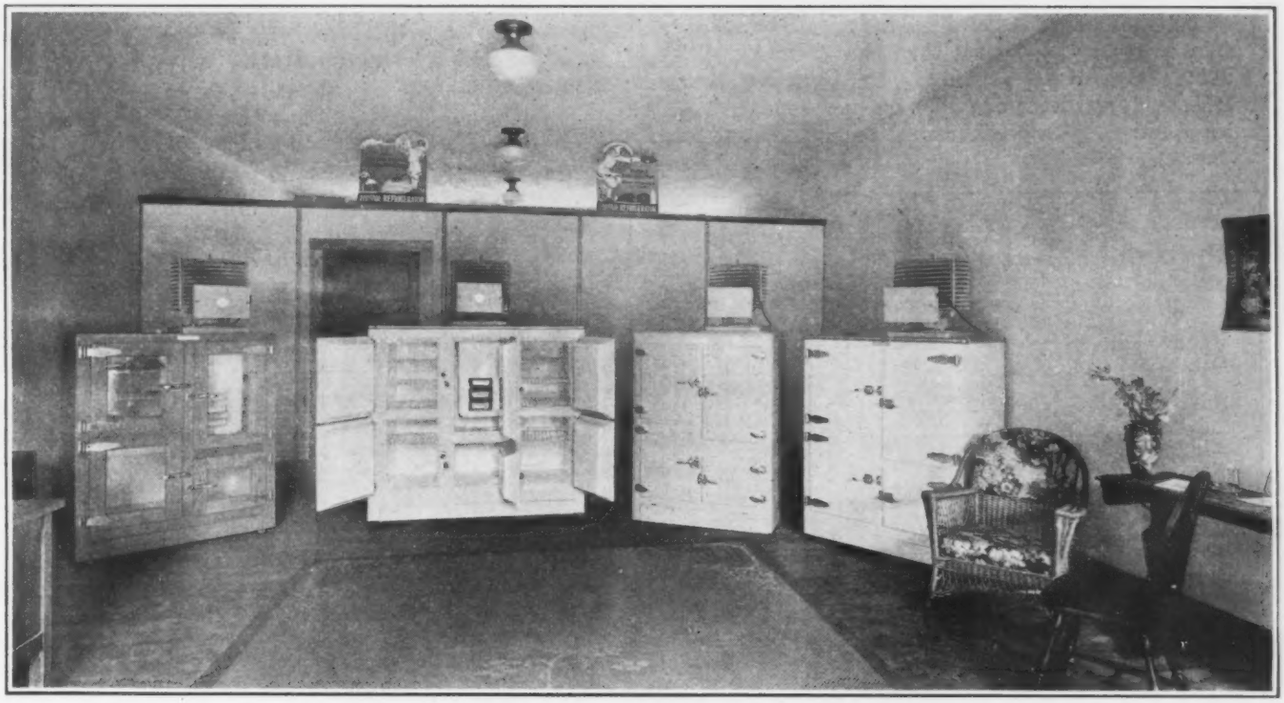


ALTHOUGH the new East River station of the New York Edison Company is well along toward completion, as indicated by the Oct. 9 issue of ELECTRICAL WORLD, some steps in its erection progress are shown here and on pages 914 and 915. Above is a barge-derrick loading part of the rotor for a 40,000-kw., 25/60-cycle frequency changer tying the new station with Hell Gate station. To the left is the armature of one of the two 60,000-kw. turbo-generators being lowered onto the foundation. Below are two 15,000-kva. frequency-changer transformers.

Status of

Electric Refrigeration

Nationwide Investigation of Existing Conditions Indicates Imperative Need for Stabilization of Production, Selling and Servicing Practices—Saturation Only 1.78 per Cent of Domestic Customers — Distribution, Sales, Installation and Servicing Organizations Must All Be Strengthened



SPECIAL DEALERS' SALES FLOOR WHICH SHOWS DESIRABLE NEATNESS

ELECTRIC refrigeration in the last year has spread like wildfire throughout the entire country. Fostered by the electrical industry and supported by the approval of the central-station companies, it has attained a surprising degree of public acceptance. There can be no doubt that the domestic electric refrigerator has arrived. This year's sales have doubled and trebled, in many cases exceeding in the first seven and a half months of 1926 the sales quotas set for the entire year. All this has not been accomplished, however, without tribulation, and although there are outstanding cases of unprecedented success in the development of this business, there have been many disappointments. Power companies, long cognizant of the desirability of this load for their residential circuits, have had to face new and vastly different problems in sales and service organization and assume additional responsibilities to their customers and the public. Refrigerator manufacturers who have worked for years to bring this machine to its present degree of practicable perfection have likewise been confronted with serious production, sales and service problems. The general public, investment bankers, inventive genius, high-class manufacturing and sales talent have been attracted by the possibilities of this most recent development of the electrical and refrigeration industries. This popularity and the rapidly broadening market have created a condition that is somewhat unstable as to sales, service, financing, production and distribution practices. Market possibilities appear almost unlimited and the business promises enormous total profits through rendering a highly valuable service to mankind. Because this is so, electric refrigeration should be developed along the safest and sanest lines that will at once safeguard the interest of the ultimate user, the manufacturer, the electric utilities and other dealers.

Seeing the need for stabilization in the development of electric refrigeration and to help bring to bear the

Table I—Domestic and Commercial Electric Refrigerators in Use in 154 Localities as of Aug. 15, 1926

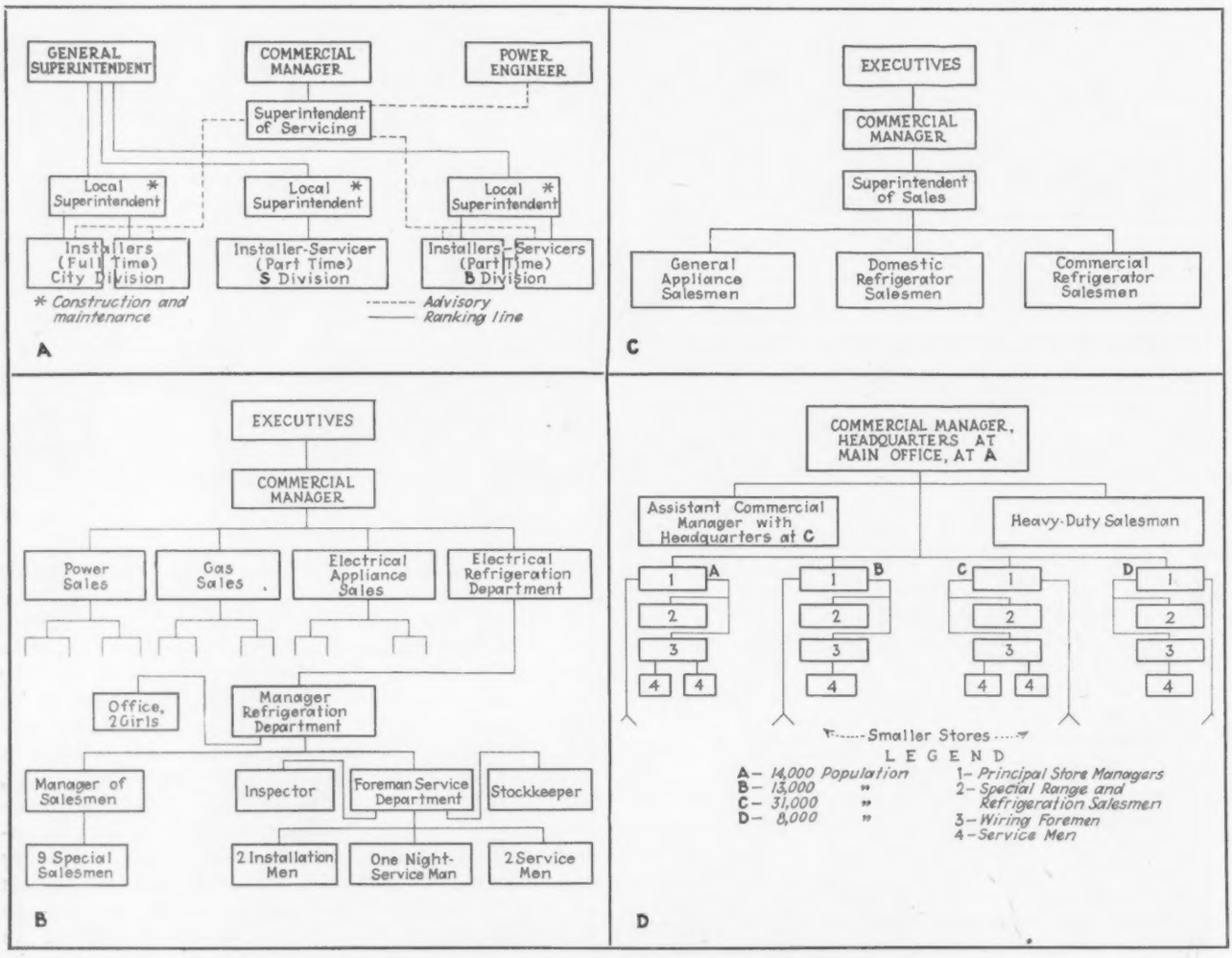
Section	Number of Localities Analyzed	No. of Customers in Localities Surveyed			No. Electric Refrigerators on Lines			Per Cent of Customer Saturation		
		Domestic	Commercial	Total	Domestic	Commercial	Total	Domestic	Commercial	Total
East	41	1,139,950	239,110	1,379,060	22,810	5,222	28,032	2.00	2.18	2.03
South	36	470,000	94,600	564,600	11,326	3,585	14,911	2.41	3.79	2.65
Mid-West	52	1,634,100	287,500	1,921,600	27,790	9,665	37,455	1.70	3.36	1.95
West	25	634,300	117,850	752,150	7,325	2,818	10,143	1.15	2.39	1.35
Total	154	3,878,350	739,060	4,617,410	69,251	21,290	90,541	1.78	2.88	1.96

best thinking and experience on this matter existing in the industry, the editorial staffs of the ELECTRICAL WORLD, *Electrical Merchandising* and *Journal of Electricity* have conducted a nation-wide survey of the situation as it exists today. The survey has been made by personal investigation on the ground.

EXTENT OF SURVEY

Upward of 200 localities were visited and individual reports prepared covering 195, of which number 154 have been tabulated in detail. This tabulation, which is published as a supplement to this issue of the ELECTRICAL WORLD, covers information as to executive reaction to the business, relations with the ice industry, sales, sales quotas, sales methods, servicing, interrelations among local dealers, distributors and manufacturers. The survey reporters have made a frank estimate of the capabilities of local outlets, and taking into consideration all factors, have appraised the present status of the local situation with respect to the past and probable future trend.

Of the localities analyzed 41 are located in the East, embracing the New England states, New York, Pennsylvania and south to the Potomac River; 36 are in the South, including those states below the Ohio River and east of the Mississippi, as well as Oklahoma and Arkansas; 52 are in the Middle West, considered to include Ohio and Michigan, west to the Colorado, Wyoming and Montana line; 25 are in the West, embracing Texas, the Mountain and Pacific states. In the



CENTRAL-STATION ELECTRIC REFRIGERATION SALES AND SERVICE ORGANIZATION

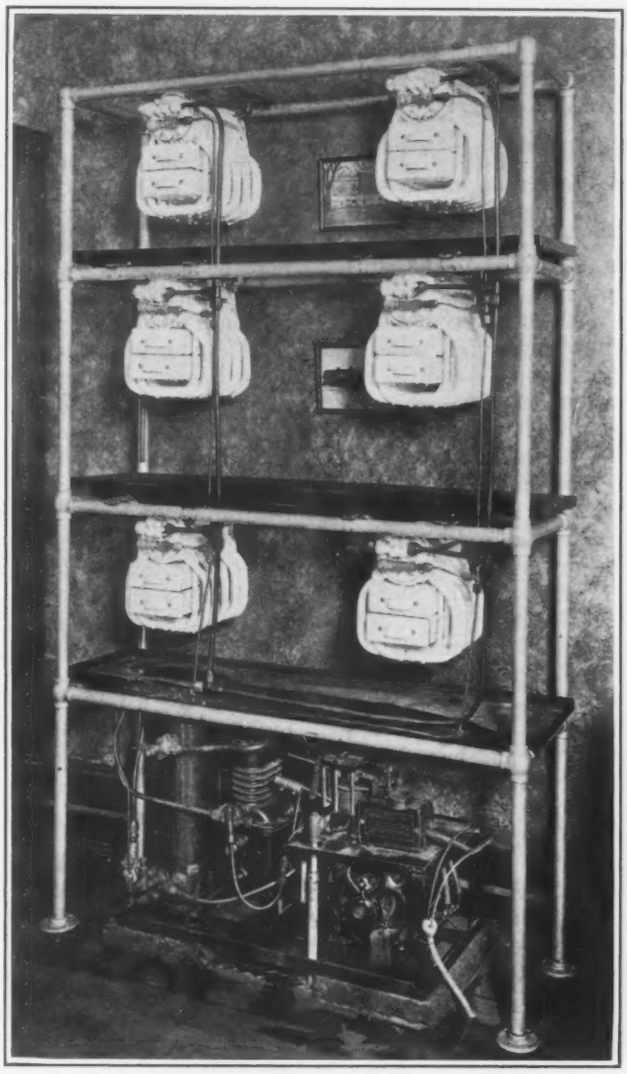
A. How one utility in a city of 75,000 has successfully utilized existing organization to build a refrigeration installation and service force.

B. Sales, installation and service department entirely separate from regular departments of a company of 400,000.

C. Sales organization, showing separation of special refrigerator salesmen from general sales force.

D. Sales and service facilities of a company serving a number of towns from 5,000 to 15,000 population over fairly widespread territory.

154 localities as shown in Table I there are 3,878,350 residential and 739,060 commercial customers, making a total of 4,617,410, or approximately 26.6 per cent of all the domestic and commercial lighting customers in the United States as of Jan. 1, 1926. Thus the survey has covered a little more than one-quarter of all the customers of the power companies and may be considered fairly to represent a typical cross-section of the entire country. It should be noted that in conducting the survey and making up the tabulation every effort has been made to avoid unusual conditions that would tend to distort the situation as a whole. The towns selected for study are representative, but in nowise should they be considered a hand-picked list. In such metropolitan centers as New York, Chicago, Philadelphia and San Francisco the utility companies, distributors and dealers were interviewed and much valuable opinion was obtained. It was not considered practicable, however, to include in the tabulation figures on sales or quotas in these large cities.



APARTMENT HOUSE EQUIPMENT USED AS WINDOW DISPLAY

Standing out head and shoulders above all else as viewed from a national standpoint are two things of particular significance to the central-station industry and to the electric refrigerator manufacturers: First, among utility executives there is a striking, almost unanimous, approval of the electric refrigerator as a load and revenue builder. Opinion differs somewhat as to sales methods, service organization and manufacturer's ability and willingness to supply repairs and sales and service help. Second, where the central-station company or other dealer has competent, fully organized sales, installation and service departments and where the refrigerators sold are of a high standard in manufacture and inspection, the sales volume has equaled and often exceeded expectations and the service obligation on machines in use has been less than was expected.

Actual sales of electric refrigerators by the power companies when compared with total sales by all dealers are also particularly significant as a measure of the central-station influence on public acceptance and the importance of these companies as a retail outlet. In the 154 localities analyzed the utilities sold 31.9 per cent of the domestic and 20.5 per cent of the commercial refrigerators sold by all dealers. There were 30 of these localities in which the power companies are not, as yet at least, engaged in the sale of electric refrigeration.

It is of interest to note that a year ago very few of the central-station companies were in any way equipped for the sale and servicing of electric refrigerators other than their regular appliance sales departments and the usual service and repair facilities. Salesmen, installation crews and service men all had to be trained, and right here let it be said that without the sales and service training schools organized and maintained by the manufacturers the sales of electric refrigerator units would be far less than they have been to date. Much still remains to be desired in the ability and availability of sales and service men, but special training is certainly a fundamental requisite.

Recapitulation of the number of electric refrigerators in use shows that as of Aug. 15, 1926, in the 154 localities investigated there were on the lines of the central-station companies 69,251 domestic and 21,290 commercial electric refrigerators, a total of 90,541. This represents an average saturation of 1.78 per cent of the domestic customers. Some allowance might be made for new customers added to lines since the first of the year, which would slightly lower the degree of saturation. Data for the four geographic divisions are shown in Table I, and it will be seen that there is quite a wide variation in the degree of saturation, especially on domestic units. The South has the highest degree of saturation, 2.41, while the West has the lowest, 1.15. The East and Middle West lie midway between the other two divisions with saturation factors of 2.00 and 1.70 respectively. Climatic and temperature conditions partly account for the difference, but there are other factors, which will be discussed later.

Assuming that the conditions found in the 154 localities represent a fairly accurate cross-section of the entire country, the foregoing may be used as the basis for tabulating the total number of electric refrigerators in use on the lines of all the power companies in the United States. This is shown in Table II, giving the number of domestic and commercial customers by sections and the number of electric refrigerator units—260,365 domestic and 78,681 commercial. The combined

Table II—Approximate Number of Domestic and Commercial Refrigerators in Use in Country as a Whole

	Number of Customers			No. Electric Refrigerators on Lines			Per Cent of Customer Saturation		
	Domestic	Commercial	Total	Domestic	Commercial	Total	Domestic	Commercial	Total
East	4,803,300	999,030	5,802,330	96,066	31,778	117,844	2.00	2.18	2.03
South	1,813,050	365,120	2,178,170	43,694	13,838	57,532	2.41	3.79	2.65
Mid-West	5,395,450	948,050	6,343,500	91,612	31,854	123,466	1.70	3.36	1.95
West	2,521,130	469,080	2,990,021	28,993	11,211	28,993	1.15	2.39	1.35
Total	14,532,930	2,781,280	17,314,210	260,365	78,681	339,046	1.78	2.88	1.96

total of 339,046 electric refrigerators in use in the country as a whole checks very closely with other data and estimates that have been derived from entirely different and independent sources.

UNITS SOLD IN 1926

Total sales of electric refrigerators by all classes of dealers from Jan. 1 to Aug. 15, 1926, in the localities surveyed were 51,304 units, of which 44,091 were domestic and 7,213 were commercial, according to the figures on sales as given by the local retail outlets. In some instances domestic and commercial sales were not segregated, hence the proportion of commercial units sold has been somewhat higher than the foregoing ratio would indicate. However, in a number of places dealers and central-station companies are not well organized to handle the commercial business as yet and some manufacturers do not make this type of unit.

Again projecting the sales in the 154 localities containing 26.6 per cent of the domestic and commercial customers of all the power companies in the United States, total sales for the first seven and one-half months of 1926 have been 165,287 domestic and 27,279 commercial units, or 192,566 in all. Comparing the sales this year with the total number of electric refrigerators installed to Aug. 15, estimates based on survey figures show that on Jan. 1 this year there were in use 146,480 units, of which 95,078 were domestic and 51,402 were commercial. Thus up to the time this survey was made one and a third times as many electric refrigerators had been sold in 1926 as were already in use at the beginning of the year. What the sales will be by Dec. 31 is highly problematical. Some dealers considered that their sales during the first seven and a half months represented only 60 per cent of the year's business. Others were not so optimistic and felt that the remainder of the year would account for a rather small share of total sales in 1926. It would seem fairly conservative, in the light of sales to date, that 250,000 domestic and commercial refrigerating units will have been sold during the year 1926.

Sales estimates and quotas for 1927 are of vital interest to the central-station companies, refrigerator manufacturers and retail dealers. These will be discussed in connection with market possibilities after considering the elements that have affected the refrigerator business during the present year and their probable influence upon the development of future sales.

Referring to the key tabulation which is published as a supplement to this issue of the ELECTRICAL WORLD a composite picture of the present status of electric refrigeration will be found. This table was set up in the form of a work sheet upon which could be assembled the definite and essential facts contained in the field reports as the result of personal interviews with utility executives and sales managers, distributors and dealers. The 154 localities have been divided into four geographical sections and the approximate number of domestic customers served by the local power company is given. Under each locality data are shown for each of the different dealers in that locality. The make of refrigerator handled by each dealer has been designated by an alphabetical letter, A, B, C, etc., and the expressions of opinion, this year's sales and next year's sales quotas have been carried through for each outlet.

UTILITY EXECUTIVE OPINION

Virtually every president or general manager of the electric light and power companies expressed himself as being highly interested in the development of domestic electric refrigeration. There is no question in their minds as to the desirability of the business from a load

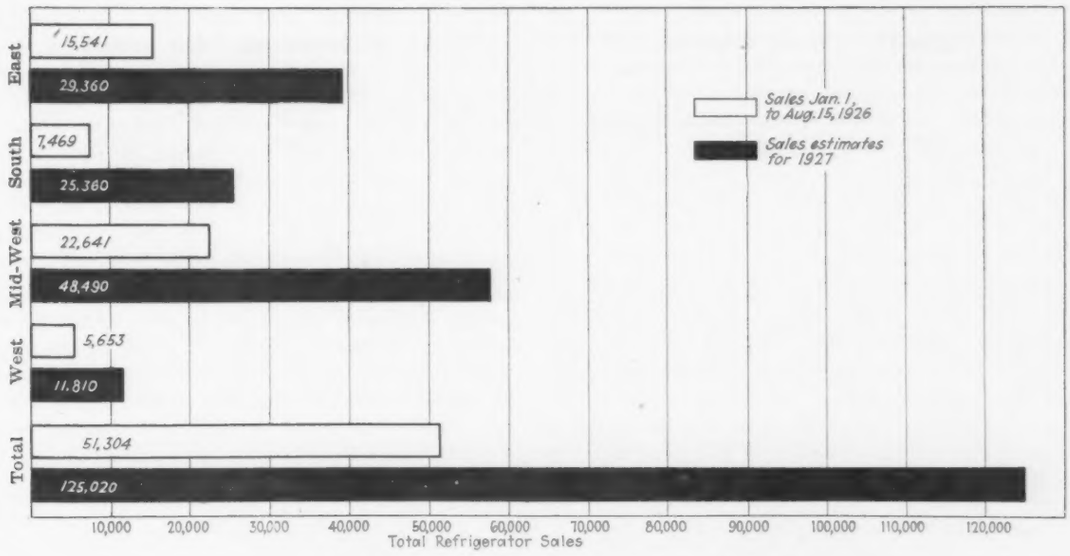
Table III—Domestic and Commercial Electric Refrigerator Sales by All Classes of Dealers in 154 Localities Jan. 1 to Aug. 15, 1926

Domestic Refrigerators

	East		South		Mid-West		West		Total	
	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent
Central stations	4,243	29.8	2,769	44.7	5,655	29.9	1,353	28.4	14,020	31.9
Distributor-dealers	6,063	42.7	1,748	28.3	8,725	46.2	1,144	24.1	17,680	40.1
Special dealers	2,197	15.4	813	13.2	3,112	16.4	1,263	26.6	7,385	16.7
Electrical dealers	1,051	7.4	497	8.1	817	4.3	380	8.0	2,745	6.2
Department and furniture stores	192	1.3	14	0.2	325	1.7	403	8.4	934	2.1
Oil-burner dealers	267	1.9	75	1.2	77	0.4	....	....	419	1.0
Hardware dealers	10	0.1	177	2.9	95	0.5	72	1.5	354	0.8
Miscellaneous	200	1.4	84	1.4	114	0.6	147	3.0	554	1.2
Total	14,223	100	6,186	100	18,920	100	4,762	100	44,091	100

Commercial Refrigerators

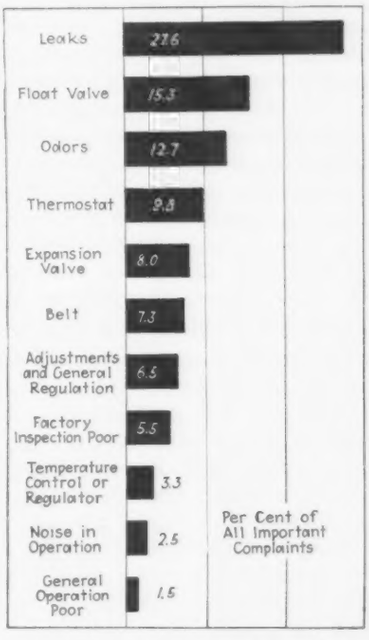
	East		South		Mid-West		West		Total	
	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent	Sales	Per Cent
Central stations	165	12.5	431	33.6	767	20.6	88	9.9	1,451	20.5
Distributor-dealers	896	68.0	554	43.2	2,460	6.1	450	50.5	4,360	60.3
Special dealers	107	8.1	256	19.9	382	10.3	353	39.6	1,098	15.1
Electrical dealers	96	7.3	40	3.1	60	1.6	....	....	196	2.6
Department and furniture stores	50	3.8	....	....	....	....	....	....	50	0.7
Hardware dealers	....	....	....	....	52	1.4	....	....	52	0.7
Miscellaneous	4	0.3	2	0.2	....	....	....	....	6	0.1
Total	1,318	100	1,283	100	3,721	100	891	100	7,213	100
Total domestic and commercial	15,541		7,469		22,641		5,653		51,304	



1927 SALES ESTIMATES OF ALL EXISTING DEALERS IN 154 LOCALITIES REPRESENTING 26.6 PER CENT OF ALL CUSTOMERS

and revenue standpoint. As one holding company president expressed it: "I have felt for twenty years that the electric refrigerator would be the very best household device we could add to our lines if we could get a machine that would work. This has been accomplished and we are pushing it hard." Another vice-president and general manager said: "Electric refrigeration is the salvation of the residential business." He estimated that in five years one-third of his domestic customers will have electric refrigerators and that these will increase his residence bill 50 per cent.

Little need exists to "sell" the utilities on the value of the load. Reviewing the attitude of utility executives in the 154 localities, it is found that 104 central-station company executives expressed themselves as highly favorable toward electric refrigeration, 40 assumed a conservative or neutral attitude and only ten could be classified as unfavorable or indifferent. The attitude of the majority of those classed as conservative or neutral, it is interesting to note, was due either to unfortunate experience in sales or servicing or to the utility executive's consideration for the local ice interests. Those few classed as unfavorable apparently had no interest in any form of load building or were skeptical as to the present state of development. Of the 30 companies not selling electric refrigerators, some are planning to enter the field next year and others are making plans for extensive co-operation with existing local outlets. On the whole, the investigation shows an exceptional interest on the part of central-station executives in the commercial possibilities of the refrigeration business. Furthermore, they have taken an unusually keen interest in the sales and servicing details and the performance of the units in actual operation.



MOST USUAL CAUSE OF SERVICE CALL OR SOURCE OF TROUBLE

Important causes for complaints or dissatisfaction with all makes of electric refrigerators as reported by retail selling outlets.

Favorable as is the executive reaction to this business, there does exist a considerable amount of criticism of some of the methods that have prevailed this year in the manufacture, sale and servicing of electric refrigerators. Unfortunate experiences that some companies have undergone in excessive servicing requirements have created doubt in the minds of many as to the degree of mechanical perfection yet attained. It is pretty generally recognized, however, that most of this type of trouble may be laid at the door of hasty producing methods and inadequate factory inspection or improper installation of the unit on the customer's premises. Refrigerator manufacturers in a great many cases have come in for very pointed criticism because units have been shipped out of the factory entirely lacking in final inspection and showing unmistakable evidence of too hurried assembly. During the spring and early summer rush to get deliveries there appeared a veritable epidemic of trouble due to poor factory inspection. This was by no means confined to any one make of machine. To the credit of the manufacturers, immediate steps were taken to correct this situation, but utility men are emphatic in their demands that the equipment be of a consistently uniform and high standard of workmanship.

Servicing costs are generally felt to be high in proportion to the revenue received from energy consumption. Accurate data on this phase of the business are meager, but there is a feeling among executives that in view of the high sale and service costs and the fact that the electric refrigerator must still be considered in the pioneering stage there is scarcely enough margin in present discounts to cover these costs, let alone a merchandising profit. A few companies have deemed it advisable to proceed rather cautiously in promoting

Table IV—Type of Salesmen Used by Central-Station Companies and Other Dealers

Section	Central Station						All Other Dealers				
	No. of Localities	No. Selling Refrigerators	Resale Plan	Special Salesmen	Gen. Sales Force	Special Men and Gen. Sales Force	Total No. Outlets Considered	Resale Plan	Special Salesmen	Gen. Sales Force	Special Men and Gen. Sales Force
East	41	34	3	18	13	1	92	1	60	31	2
South	36	29	1	13	15	2	60	0	18	42	..
Mid-West	52	46	2	23	21	2	59	2	40	17	..
West	25	15	0	7	8	3	44	..	27	17	..
Total	154	124	6	61	57	8	255	3	145	107	2

the sale of the electric refrigerator because they believe it subject to radical changes in design and possible sharp price reductions, either of which would result in dissatisfaction by customers, particularly those who have bought on long-time payments.

Sales, service and advertising assistance as rendered by manufacturers has for the most part been of an exceptionally high order, and the utilities are anxious that these facilities be expanded to meet the needs of the increasing market. There is room for improvement in the servicing of customers' installations, and utilities feel that for the present at least both they and the manufacturers must adopt a very liberal policy in the matter of labor and material for repairs. Typical of this attitude is this statement by a general manager of one of the large companies: "Service is most important. We will service any make of machine, because we want to get it back on our lines that very day and impress upon the customer the value of the service he is receiving."

Although it is possible to pick flaws in any new device, the majority of companies feel that the electric refrigerator has reached a stage of development where they can safely recommend it to customers. "Defects in the product," said one executive, "have given about as little cause for criticism as a new product of this kind could be expected to give, although it is by no means perfect." "As to the electrical and mechanical considerations," said another, "all refrigerators of standard manufacture can be depended upon to perform consistently, continually and satisfactorily, provided they are installed in accordance with the manufacturer's rules and instructions."

Power companies have taken up the sale of electric refrigeration because it has fitted in admirably with their program of load and business development. It has been recognized that the central-station company's stamp of approval on this comparatively new device would have a strong influence in creating confidence in the minds of customers, and the fact that the utility is itself selling electric refrigerators has proved a valuable asset to other dealers in the same locality. No utility company expects or wants to sell all or even a majority of the refrigerator units in its territory; in fact, the entrance of competent dealers in the business is welcomed and encouraged. The relation of the central-station company to other refrigerator outlets may be summarized in the policy enunciated by a utility president widely known in the industry for his keenness in commercial sales problems. He stated that his company entered the field to stimulate business at the written request of leading dealers and with due appreciation of the load-building possibilities.

Relations with Ice Industry

Introduction of electric refrigeration has raised the question of its probable effect upon the business of the local ice companies, which have in some cities evinced considerable alarm over what has appeared to them to be an invasion of their rightful field. For the power companies this has been a rather delicate problem, because in many instances they have been supplying nearly all power requirements of local ice plants. To complicate the situation, a number of advertisements were published in the early stages by both the ice companies and the electric refrigerator advocates that were derogatory to the other's product. Fortunately both sides of the controversy quickly recognized the uselessness of such a policy and discontinued their vituperative attacks upon each other. As a matter of fact, the publicity now being given to refrigeration, whether it be electric or ice, is increasing business for both, according to experiences from some localities.

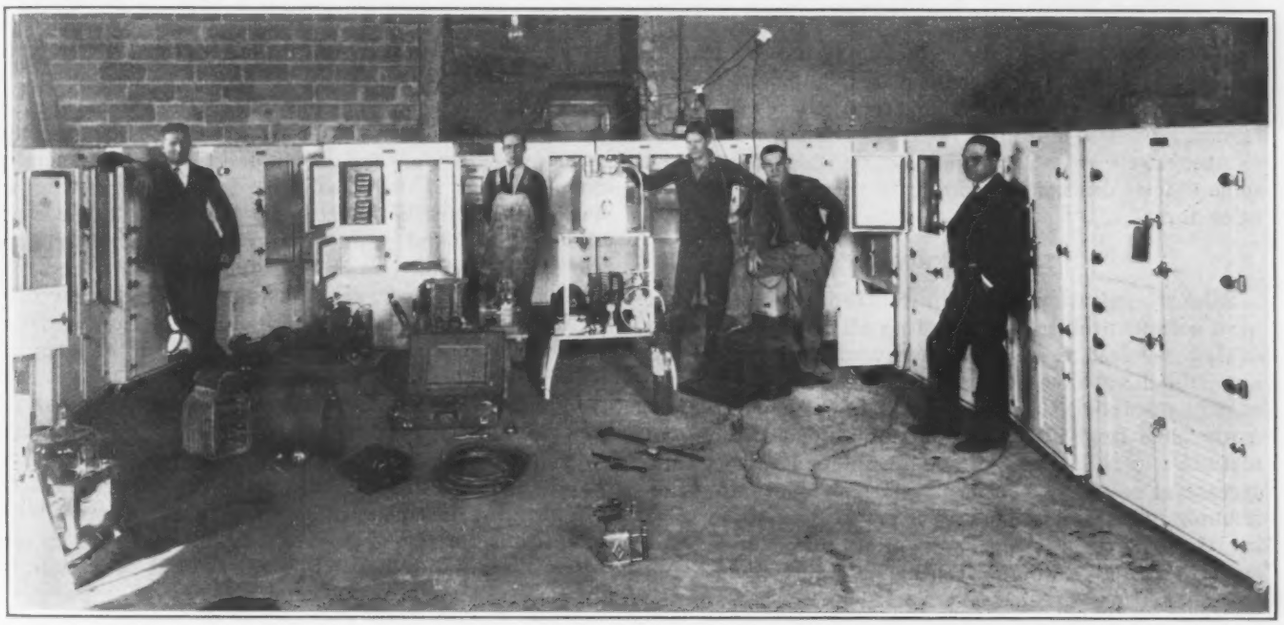
The situation was handled in one city of about a quarter million population in this manner: Shortly after the central-station company commenced selling electric refrigerators 30 members of the local ice association called a meeting, at which the president of the utility company was present. The ice manufacturers stated their case, which virtually accused the power company of trying to put them out of business. The utility executive then explained his company's attitude

Table V—Ratio of Salesmen to Domestic Customers in Fifteen Typical Localities

Section	Central Station			All Other Dealers		Totals	
	No. Domestic Customers	No. of Salesmen,	Customers per Salesman	No. of Salesmen	Customers per Salesman	No. of Salesmen, All Dealers	Customers per Salesman
West	2,000	1	2,000	1	2,000	2	1,000
East	5,000	4	1,250	4	1,250	8	625
Mid-West	7,500	1	7,500	2	3,750	3	2,500
South	11,000	5	2,200	6	1,833	11	1,000
East	14,000	2	7,000	4	3,500	6	2,333
East	20,000	6	3,333	6	3,333	12	1,666
Mid-West	30,000	1	30,000	10	3,000	11	2,727
West	50,000	7	7,142	20	2,500	27	1,851
Mid-West	80,000	9	8,888	20	4,000	29	2,757
East	80,000	15	5,333	17	4,758	32	2,500
Mid-West	100,000	20	5,000	20	5,000	40	2,500
Mid-West	120,000	6	20,000	18	6,666	24	5,000
East	170,000	18	9,444	51	3,333	69	2,463
Mid-West	180,000	8	22,500	12	15,000	20	9,000
East	250,000	11	22,727	62	4,032	73	3,438
Total	1,119,500	114	9,819	253	4,424	367	3,050

—that all advertising had been fair; that absolutely no mention of ice had or would be made; that electrical refrigerators were going to be sold in the city anyway and that some unscrupulous dealers might employ questionable tactics against the ice dealers if the central station were not in a position to exercise its influence. He then explained the value of better refrigeration and pointed out that in that locality the market for ice was less than 50 per cent developed. The meeting closed by the ice association extending the utility president a vote of appreciation for his suggestions, and, like the fairy tale, relations have been harmonious ever since.

There are a number of instances of local ice companies taking on the sale of electric refrigerators, and one large ice and cold storage company has developed a



REFRIGERATION WAREHOUSE AND REPAIR SHOP OF UTILITY WHERE ALL MACHINES ARE TESTED AND RUN IN FOR TWO DAYS BEFORE INSTALLATION

domestic electric refrigerator that is being marketed extensively throughout the country. It seems likely that the solution of the ice manufacturer's problem may be in offering a refrigerator service by tying up with some good electric refrigerator and offering either mechanical or ice refrigeration.

MAKES OF REFRIGERATORS SOLD

In tabulating the data contained in the field reports it was found that 28 different makes of electric refrigerators occurred with sufficient frequency to be included. This of course does not include all of the machines that have been produced, as there are 93 or 95 different makes on the market, some having built less than 25 units. There are also about 150 or 160 more in some stage of development. But unless a refrigerator has attained a fair degree of retail outlet representation it has been impossible to include it in the tabulation. It is not the intention and no attempt has been made to draw comparisons of the relative merits of different makes of electric refrigerators.

SELLING OUTLETS

Of the 154 central-station companies visited, 124 are actively engaged in selling electric refrigerators. There are 65 distributor-dealers—that is, distributors or what might almost be termed factory branches maintaining extensive retail selling organizations—84 special dealers who sell electric refrigerators exclusively, 86 electrical dealers or contractors, seventeen department or furniture stores, eleven oil burner or house-heating concerns, fifteen hardware stores and 34 miscellaneous dealers, including radio shops, plumbers, garages, auto supply houses, free lances and small agents. Total sales by each class of dealer during the first seven and one-half months of this year are shown in Table III. As might be expected, the distributor-dealer organizations have the highest percentage of sales, 40.1 per cent of domestic and 60.3 per cent of commercial units. Nearly all of the distributor-dealers have been in business from two to five years and in that time have built up substantial sales and service departments and have acquired a great deal of valuable experience in the technique of the business. The central-station companies have accounted for 31.9 per cent of domestic and 20.5 per cent of commercial units sold, which, in view of the fact that most of them have been active for but a little more than a year, speaks very well for their ability to turn such an effective selling organization into a specialized field on such short notice. Special dealers have sold 16.7 per cent of the domestic and 15.1 per cent of commercial units, indicating the importance of specialization in this business when compared with the sales of other dealers who handle electric refrigerators as an adjunct to their regular business. Electrical contractors and dealers have made a very good showing, selling 6.2 per cent of the domestic machines and 2.6 per cent of the commercial. Sale of electric refrigerators fits in very well with the electrical contractors' business, because frequently the installation work requires a certain amount of wiring, especially for remote compressors. The low percentage of the total sales, 5.1 per cent domestic and 1.5 commercial, made by the department and furniture stores, oil-heating, hardware and miscellaneous dealers combined can be attributed to the specialized nature of the sales and service organization required, which these outlets hesitate to set up.

Table VI—Sales Plan Used or Advocated by Central Stations and All Other Refrigerator Dealers

Section	Central Station: No. of Localities	No. Selling Refrigerators	Continuous Sales Plan	Continuous with Campaigns	Seasonal Sales Plan	All Other Dealers: Total No. Considered	Continuous Sales Plan	Continuous with Campaigns	Seasonal Sales Plan
East	41	34	25	2	7	92	79	..	13
South	36	29	16	13	..	60	51	9	..
Mid-West	52	46	15	15	16	59	49	1	9
West	25	15	11	4	..	44	43	1	1
Total	154	124	67	34	23	255	222	11	23

The high percentage of total commercial unit sales made by distributor-dealers, central-station companies and special dealers indicates again the value of specialization in the business. It has generally been found that unless a dealer has a salesman who is specially trained in the commercial phase of refrigeration and who is something of a refrigeration engineer, misapplications may be made or inadequate equipment may be sold and as a result the commercial sales will be retarded. Central-station power salesmen have worked out very well in this respect and the distributors and some special dealers are adding to this branch of their sales forces.

SELLING METHOD USED

Sales organization and selling methods have been the most serious problems confronting all classes of dealers during the last year. Salesmen competent to do this kind of selling have been scarce. Few had any knowledge of the article they were to sell and although a great many have been attracted and undergone training at manufacturers' schools, the percentage developed into successful salesmen has been relatively low. One distributor pointed out that only 7 per cent of those passing through the salesmen's training course had made good in actual selling. Another distributor declared that man power in the sales forces is the neck of the bottle through which next year's sales must pass.

Power companies are about evenly divided at present in the use of special refrigerator salesmen or their general sales force—61 companies employ special salesmen, 57 use their general sales force and eight are using special men assisted by the general sales force. Only six of the 124 companies have so far entered into resale agreements with manufacturers whereby the power company does a certain amount of advertising, displays the equipment in salesrooms and carries the time payments while the distributor or manufacturer does the actual selling, installing and servicing. This method of selling has only recently been available for electric refrigerators and promises to develop to a considerable extent.

A great many companies are using their general sales force for refrigerator selling, because no specially trained men were available and it is pretty generally agreed that it is more desirable to have men who can devote their entire time to this business. Some companies have found it advantageous to have their electric range salesmen work on refrigeration at the same time, as, in the West, range users have often proved to be the best prospects for refrigerators. However, the use of the general sales force has had a tendency to draw salesmen away from other lines, and as a consequence most companies are taking steps to build up crews of special refrigerator salesmen. For this purpose the manufacturers' training courses have been found most effective. One to two weeks of such extensive training has usually been sufficient for men with an aptitude for the work, but it usually takes from one to three months' selling effort in the field for a man to hit his stride.

Other dealers than the power companies are even more inclined to the use of special salesmen, which is natural in view of the fact that both distributor-dealers and special dealers are essentially in a specialized business. Only three dealers outside of the utilities were found to be operating under resale plans. Table IV shows the practices of central stations and other outlets with respect to their sales forces.

The ratio of salesmen to number of customers is a question that has been raised in every locality where electric refrigeration is sold. Among individual dealers there has been very little opinion as to the maximum number of salesmen that could economically work in a given territory, as no dealer has felt that his sales force approached this limit. One power company that has been very successful in the sale of electric refrigerators and has attained a saturation of about 3 per cent of its domestic customers used all of its general salesmen and special refrigerator salesmen in a series of campaigns. During these activities a ratio of one salesman to 1,500 domestic customers was maintained. At other times each special refrigerator salesman may be said to cover about 10,000 customers, with the general force turning in prospects. In this connection considerable success is being met in the employment of junior salesmen who do no selling but do house-to-house canvassing to uncover prospects or leads and make definite appointments for the regular salesman to call and go into the full details of electric refrigeration.

Table VII—Major Sales Resistances in Selling Electric Refrigerators

	Number of Dealers: East	South	Mid-West	West	Total
Sales resistance	101	46	101	58	306
First cost	74	46	83	50	253
Expect price reduction	36	10	31	9	86
Unconvinced of final development and mechanical perfection	24	16	45	21	106

Table VIII—Service Guarantees and Charges for Repairs

Central Station		All Other Dealers	
Free Service Guarantee			
Number of expressions	110	Number of expressions	173
One year	103	Year	150
Two years	1	Six months	3
Fifteen months	1	Three months	27
Continuous	5	Continuous	3
Charge for Repairs			
Number of expressions	20	Number of expressions	20
Charge after year	20	Charge after year	20
Charge for Labor			
Number of expressions	10	Number of expressions	13
Charge after year	10	Charge after year	13

The number of domestic customers per refrigerator salesman in fifteen typical localities is shown in Table V. There is such a wide variation in the practices of both the power companies and all other dealers that it is almost impossible to discover any trend. If average figures can be accepted, it would appear that there is about one refrigerator salesman to every 3,000 domestic customers. Power companies alone show an average of one salesman to nearly 10,000 domestic customers. Judging by the success of some companies and from market possibilities, it would seem that the ratio of salesmen to customers that could be employed by all dealers without stepping on each other's toes too often would be about one to 1,500. For the central-station company alone the ratio might run from this figure up to one to 10,000 customers, varying inversely with the intensity of effort the company desired to make and how well other retail outlets were doing a selling job. Ability to find and train salesmen will probably keep these ratios fairly high for some time.

Admittedly the late winter, spring and summer months have this year represented the peak sales period for all dealers. This seasonal feature of the business is undesirable alike to manufacturers, central-station companies, distributors and other outlets, and there is a strong tendency, as shown in Table VI, to get away from seasonal sales plans and make the effort as continuous as possible. Sixty-seven of the 124 central-station companies and 222 of the 255 other dealers declared themselves in favor of continuous year-around sales effort, whereas 34 power companies and eleven dealers favor a continuous plan interspersed with seasonal campaigns. A decided minority of dealers were inclined to seasonal selling, and the specialized nature of the business indicates that from an economic standpoint selling effort should be spread as evenly over the twelve months as possible.

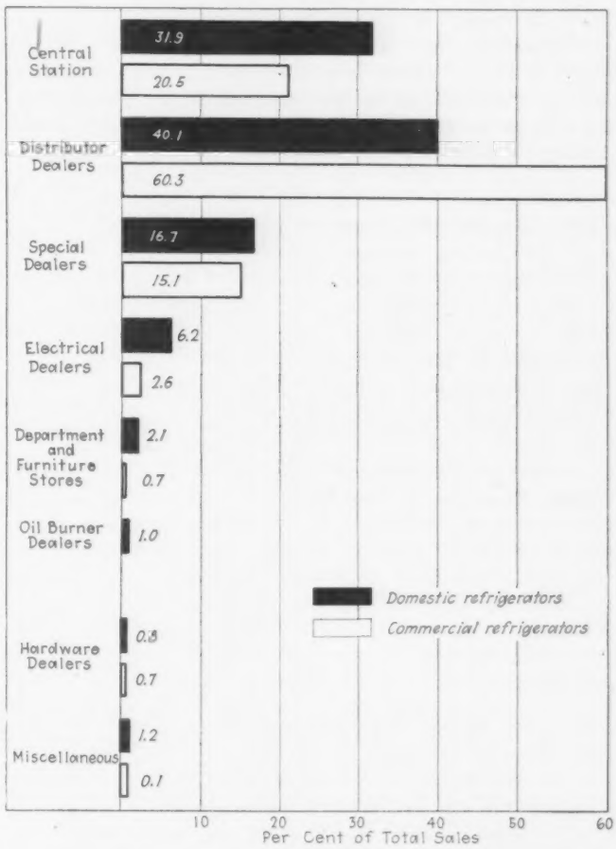
Compensation of Salesmen

Methods of paying salesmen vary widely, particularly among power companies. Straight salaries, salaries plus commissions, drawing accounts against commissions and straight commissions may be found. It is commonly agreed that refrigerator selling requires a high type of salesmen and that the remuneration must be sufficient to attract and hold them. It should be possible for them to earn from $250 to $500 per month and even more during the most active part of the year. Straight commissions of 10 per cent of the installed price have worked out well in a number of places, whereas in others commissions as high as 15 per cent on factory list, not including installation charge, has proved satisfactory. Another company has obtained good results with a flat salary of $150 a month plus 2 per cent commission on the installed price. Still another company pays its salesmen $50 a month and 7½ per cent commission on factory list. The most popular method among dealers appears to be a flat 10 per cent commission on total price to the customer.

Typical Refrigeration Departments of Utility Companies

Organization of the central-station company for sales, installation and service of electric refrigeration has been repeatedly emphasized as of primary importance to the successful development of this business. A great many companies are at something of a loss to know what would be the most practicable set-up for such a department. Good results have been attained in a number of companies by somewhat different methods. The plans of refrigeration department organization of four widely separated utilities that have done an outstanding job in refrigeration selling are shown at the outset of this article. Chart A represents the more conservative practice of a company that has utilized its existing service departments, upon which has been superimposed the electric refrigerator installation and service department. In this locality the growth of electric refrigeration has not been phenomenal, but it has shown a steady increase, and this arrangement has worked out well to date.

In direct contrast with this is the company represented by Chart B, where the company has set up a



PROPORTION OF TOTAL DOMESTIC AND COMMERCIAL REFRIGERATORS SOLD BY ALL CLASSES OF DEALERS

refrigeration department entirely separate from its regular sales and servicing departments. The new department is made up of nineteen men and two women, including the manager of the department, who has complete charge of all ordering, sales and service and reports directly to the commercial manager of the company. The co-ordination of sales and service under one authority has been found to have many advantages.

Much detail in handling salesmen is taken care of by the manager of the salesmen, who is paid a salary plus a commission on total monthly sales. He reports directly to the manager of the refrigeration department. Each salesman works in a restricted territory that includes about 7,000 meters, both commercial and domestic. All sales in that territory are credited to the salesman, whether made by him or at the company's store. In

receiving credit for store sales, however, the name of the customer must have been previously turned in by the salesman as a prospect. The salesmen are paid a straight commission based on factory list prices. A drawing account is allowed the salesman during the first three months of employment while he is learning the business.

Orders properly approved by the manager of the refrigeration department and the credit department are sent with specifications drawn up by the salesman to the foreman of the service department. The foreman records the order, including the time it was received in his office, and then turns it over to the inspector. The inspector goes to the customer's house, checks all specifications made by the salesman, makes a sketch of the kitchen and the location of the compressor, cabinet (and plumbing if necessary) and lists all material that will be necessary to make the installation.

Information thus gathered by the inspector is returned to the foreman, including definite arrangements with the customer as to the time when the installation men will be permitted to do the work on the customer's premises. With the foreman's stamp of approval, the stock clerk routes the installations and lays out the exact material required for each job. The installation man, reporting in the morning, has only to take the materials laid out for him by the stock clerk the previous afternoon, goes to his jobs in the order called for and is sure of finding the customer at home to let him in, because of the appointment that was made by the inspector.

A service man checks each installation a couple of days after it is made. With machine installed, checked and inspected, a report goes to the main office from the warehouse and service shop giving time and material costs. The inspector examines each installation every 90 days. This plan, worked out by the manager of the refrigeration department, has proved very successful.

The merchandising organization of a company where the refrigerator salesmen, both domestic and commercial, have been separated from the general sales force is shown by Chart C. This is a locality of 90,000, and it will be noted that in this instance the superintendent of general merchandise sales also supervises the refrigeration business.

The method of organization of a company that operates in a number of comparatively small towns in a scattered territory is depicted in Chart D. This presents a problem that is confronting many central-station executives, particularly in the sparsely settled localities common to sections in the South, mid-West and West.

More than ever before it has come to be realized that efficient and at the same time economical sales and service organizations are required to handle the distribution of electrical refrigerators in the many companies that are operating a chain of properties and are directing their merchandising and commercial activities from a central point. A number of companies that have attempted to sell refrigerators under these conditions without foresight as to adequate organizations for selling, servicing and installing have come to grief. Others have been conservative to the point where they have made no attempt to study their problems and by so doing have greatly retarded the development of the electric refrigerator business in the localities they serve.

HANDLING SERVICE

Centralization of management, standardization of policies and co-ordination between sales and service departments, coupled with a thorough analysis of local problems, will help a utility company working under these conditions.

One utility company that has developed its service department to a high degree of efficiency has made up a standard kit of equipment that is taken by the service man whenever he goes out on a complaint or service call. The box which is illustrated measures 21¾x31½x12 in. and can be easily carried on a light commercial truck. The box is designed to carry two smaller compartment boxes nested within the main kit. One of these carries miscellaneous small supplies and may be conveniently carried inside the customer's premises. The material carried consists of the following supplies:

Six belts.
One compressor valve and plate.
One condenser shut-off valve and one suction shut-off valve.
One flat pulley and one V-pulley.
One drum of SO_2, 4 lb.
One expansion valve complete.
Three oil cans.
One spare thermostat.
One can glycerine and alcohol.
One can oil (½ gal.).
One spare thermostat cup.
One compressor discharge valve and one piston valve.

Table IX—Periodic Inspection of Electric Refrigerators

No. of Dealers	Frequency of Inspection	No. of Dealers	Frequency of Inspection
1	2 weeks	6	2 months
12	6 weeks	5	Quarterly
10	1 month	1	6 months

Closely related with installation and service is the matter of inspection of machines already installed. In this regard no standardization of inspection policies could be determined, because of the variety of practices now in use. Of the 34 dealers definitely maintaining periodic inspection, frequency varied from one to six months.

Table XI—Type of Installation for Domestic Electric Refrigeration Advocated

	East	South	Mid-West	West	Total
Total number of dealers expressing themselves	91	59	100	42	292
Remote	76	50	78	38	242
Self-contained	13	9	14	4	40
Either type of installation	2	0	8	..	10

Table X—Manufacturer's Service on Repairs as Viewed by Dealers

	East	South	Mid-West	West	Total
Number of dealers expressing themselves	99	39	106	60	304
Receiving good service	65	28	75	30	198
Receiving fair service	20	11	20	25	76
Receiving poor service	14	..	11	5	30

Table XII—Dealers' Opinion of Manufacturers' Discounts

	East	South	Mid-West	West	Total
Number of dealers expressing themselves	109	54	106	43	312
Discounts satisfactory	27	24	34	24	109
Discounts fair	53	30	46	14	143
Discounts too low	29	..	26	5	60

Prices are quoted to customers in several ways: A flat price installed where the freight, cost of handling and installation have been added to the factory list price; factory list plus a fixed installation charge plus also an additional charge if the compressor is to be remote from the box; factory list plus an installation charge regardless of whether the unit is to be remote or self-contained; list price plus an individual estimate for the cost of installation, including freight and handling. Installation charges vary with different dealers and machines, ranging from $15 to $60 added to the factory list price. Considerable additional wiring is required in some places, especially in those towns that have extraordinarily stringent requirements, such as putting motors on a separate circuit. In most localities, however, the refrigerator is connected to the regular lighting circuit and no difficulty has been experienced except, where house circuits are small, an occasional dimming of lights when the motor starts. A number of dealers are opposed to naming prices f.o.b. factory, as prospects dislike the additional charge to cover freight and installation after having formed a preconceived idea of the price.

Many conditions peculiar to the section of the country or to a particular central station or dealer have influenced the choice of method used in determining the price quoted to the customer. It is extremely important to commercial managers, in the rapid development of the refrigerator business, that accurate and complete records of freight, drayage, selling, installation and servicing costs be kept. It has been the experience of several companies after the first six months or a year to find that their refrigerator business is showing a balance on the wrong side of the ledger. This can be attributed as much to failure to keep adequate sales and service records as to the inherent cost of pioneering a new device.

Facing conditions as they are at present, there has been a larger percentage of cash sales of refrigerators than can be expected in the future, due to the concentrated sales efforts directed toward the better class of prospects. The problem of time payments is becoming more important as the market broadens to include more prospects. The results of this survey showed a variety of methods being used. The most typical were:

1. First payment of one-twenty-fifth selling price quoted, which includes installation charge. Balance paid in 24 months. Twelve per cent of unpaid balance added for carrying charges.

2. To responsible customers, $10 first payment. Twelve months to pay, with no carrying charge. If payments are extended more than twelve months, a 5 per cent carrying charge is made.

3. Free trial to reliable customers. Ten per cent of selling price (factory list plus freight plus installation) as down payment, with the balance in eleven equal payments added to monthly lighting bill. Five per cent added if payments are extended over a period of 23 months.

4. Thirty days' free trial. Thirty months to pay. Allowance of $5 to $100 for an old icebox.

5. First payment of 20 per cent of installed price with twelve to eighteen months' payment period, with proportionate carrying charges. Payment period extended to 24 months with no extra carrying charge during campaigns.

6. Twenty per cent down payment with twelve months to pay. Thirteen and one-half per cent charge for carrying account.

Although several of these methods are open to criticism, a summary of the length of time payments by refrigerator dealers shows a range from ten months to as long as 36 months. The most popular terms are from twelve to eighteen months. Whatever time is given for payment, it is the unanimous opinion of the successful dealers that a substantial first payment be made—at least enough to cover the cost of installation. The unsuccessful experiences of several commercial managers in giving too liberal free trials and payment periods may be taken as a warning that a definite amount of conservatism is needed in payment policies.

DUPLEX COMPRESSOR AND BOX INSTALLED IN A MASONIC HOME

A very limited number of dealers are giving cash discounts. The plan most common is to quote the installed price plus carrying charges, starting with the assumption that the sale is to be made on the installment plan. If, after the sale is closed, the customer wants to pay cash or the salesman convinces the customer that paying cash is more economical, a "cash discount"—the subtraction of the carrying charges originally added to the quoted price—is made.

Table VIII shows the trend in practice with regard to free service guarantees and charges for material and labor after expiration of the guarantee period. The most common free service guarantee now in use by both central stations and dealers selling electric refrigerators is for one year. With distributor-dealers, special dealers and most dealers other than the central stations, there is a tendency to reduce this year guarantee to three or six months. However, due to the newness and inexperience, it has become the custom to extend this guarantee longer than one year, even though it is not written in the bill of sale. The central station in particular is giving more liberal service than most other dealers.

Further, many dealers, in their desire to become firmly established in business, have disregarded or minimized charges for repairs and labor. The present tendency toward more liberal time payment terms has

Table XIII—Manufacturers' Sales Assistance, Advertising Assistance, Delivery of Units and Delivery of Repairs

	East				South				Mid-West				West				Totals			
	Total No. Dealer Expressions	Good	Fair	Poor	Total No. Dealer Expressions	Good	Fair	Poor	Total No. Dealer Expressions	Good	Fair	Poor	Total No. Dealer Expressions	Good	Fair	Poor	No. Dealer Expressions	Good	Fair	Poor
Sales assistance	102	48	39	15	55	28	25	2	107	45	46	16	36	18	13	5	300	139	123	38
Advertising assistance	106	50	39	17	58	31	25	2	106	46	41	19	38	17	19	2	308	144	124	40
Delivery of repairs	95	63	24	8	42	20	21	1	95	68	15	12	34	25	9	..	266	176	69	21
Delivery of units	110	82	16	12	46	21	22	3	112	84	18	10	40	29	5	6	308	216	61	31

served to lengthen free service to cover the deferred payment period.

A variety of methods is used in financing time payments. The power companies almost without exception are providing their own capital for this purpose. Out of 220 other dealers 81 are financing their time payments through the manufacturer and the remainder are using one of the following methods: Distributor, local bank, finance corporation (local or national), central-station company or themselves. The number using the manufacturer's financial plan appears smaller than might be expected, but this was explained by several dealers in the statement that use of the manufacturer's plan was too slow and expensive, as it usually required 60 days to get the money on the paper and it could be done better through some local finance company. Local facilities and financial resources of individual dealers have a great deal to do with the type of financing used. Considerable capital is required to carry on a successful electric refrigeration business, and manufacturers can relieve their dealers of a considerable financial burden by providing an effective service of this kind.

In the actual selling of electric refrigerators all dealers, and their salesmen as well, report that first cost is the principal and foremost sales resistance encountered. Anticipation of price reduction is closely related to the objection to first cost, but the latter overshadows all other excuses that prospects put forth for not buying now. Dealers also state that many people are unconvinced that the machines have attained mechanical perfection and are awaiting final development. A stock argument advanced on this score has been that "they will be cheaper and better next year." Little difficulty is being experienced, however, by the alert salesman, who meets this objection by pointing out to the user that if he waited for perfection before purchasing an automobile or a radio, he probably never would own either. Table VII shows the relative weight of these three points of sales resistance as expressed in the opinion of 306 users. There is no doubt that the satisfactory experience of users who have purchased refrigerators this year will go a long way by word-of-mouth advertising in convincing the public of the practical perfection of electric refrigeration. It seems likely too that prices should be pretty well stabilized by next year.

Another form of sales resistance noted by many dealers is the tactics employed by competitive salesmen in their zeal to sell their refrigerator against some other make. It is not the loss of the sale in such cases that worries the dealers, but criticism of other products succeeds only in creating doubt in the mind of the prospect of any kind of electric refrigerator. This is indeed poor salesmanship, and it appears almost too obvious to call attention to the destructive influence of such practices. One power company selling a certain make goes to the length of stating in its advertising that although it sells this machine, there are other makes being sold that will prove satisfactory, and these are named in the advertisement.

Need of greater education of the public to the value of refrigeration, and of electric refrigeration in particular, is pointed out as essential to the development of the market. A recent investigation revealed that only 32 per cent of the householders in a city of 300,000 use ice during any part of the year and only 12 per cent, or approximately one-third of these, use ice the year around.

Relations Among Local Outlets

The relations among dealers who sell competing machines are on the whole fairly satisfactory and although not perfect are improving as compared with the first intensity of selling when there was considerable bitterness and many accusations of unfair selling methods. There are price-cutting claims made, but where these have been found there is a strong suspicion that it is a case of the pot calling the kettle black and one dealer is about as much to be censured as another. Salesmen splitting commission with customers has been experienced in a few localities, but not often. Another form of price cutting has been excessive allowance on old ice-

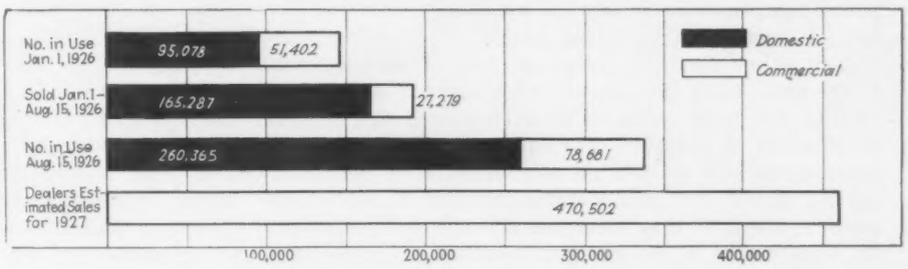
Table XIV—Reporting Editor's Impression of Competency of Electric Refrigerator Outlets

	East				South				Mid-West				West				Totals							
	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Fair	Poor	No. of Expressions	Good	Per Cent	Fair	Per Cent	Poor	Per Cent
Organization																							
Central stations	33	17	9	7	29	6	14	9	44	23	14	7	15	1	11	3	121	47	38.8	48	39.7	26	21.5
All other dealers	95	34	40	21	46	9	29	8	79	24	39	16	47	14	20	13	267	81	30.3	128	48.3	58	21.4
Initiative																							
Central stations	33	17	12	4	29	12	13	4	44	27	14	3	15	7	5	3	121	63	52.1	44	36.4	14	11.5
All other dealers	97	44	34	19	45	17	21	7	73	40	18	15	47	23	17	7	262	124	47.3	80	30.5	58	22.2
Skill																							
Central stations	33	18	12	3	29	8	14	7	44	23	18	3	15	1	11	3	121	50	41.3	55	45.5	16	13.2
All other dealers	91	31	41	19	45	7	31	7	75	35	28	12	47	16	23	8	258	89	34.5	123	47.6	46	17.9

boxes taken in or else selling the refrigerator unit at the regular price and allowing a discount on the box where the dealer is selling refrigerator boxes of a different make than the compressor unit. In the larger cities, where apartment house installations make up a good share of the business, there is cause for complaint on the price concessions. Some dealers believe that no discounts should be allowed to builders or contractors, and the other extreme is represented by rock-bottom prices to get the business. It would be most desirable if a fairly uniform scale of discounts for quantity purchase could be set up. Of course, this involves the question also of how much servicing should go with such installations.

Unethical sales methods, mentioned previously as one of the contributory sales resistances, have cropped up from time to time, always of course with the finger of accusation pointing at the other fellow. All dealers themselves discountenance such practices and declare that they have instructed their salesmen to refrain from criticising the design of other makes or the kind of refrigerant or use of other questionable arguments. Most of such practices when they do occur are traceable to the salesman. For the most part, this kind of selling has been the exception rather than the rule, and during the progress of the investigation it was noticeable among different dealers that they scarcely mentioned troubles that competitive makes were experiencing. In fact, many dealers were so enthusiastic over the refrigerator they were handling that the survey reporter found it necessary to listen to a considerable amount of selling talk on that particular make before discussing the main object of his visit.

Comparatively little criticism of central-station company competition was heard, considering the number of utilities selling electric refrigtors and the aggressive methods pursued. Most dealers felt that the entrance of the local power company into the business had had a stabilizing effect and had served to build confidence in the public mind. Several distributor-dealers interviewed were anxious to see the local central-station companies increase their activities and expressed the opinion that if those companies that are not now selling electric refrigerators would do so, it would increase all dealers' sales in that locality. The complaints against the power companies' merchandising policies are about the same that have arisen before. Too liberal time payments, too much free service and taking advantage of its dominant position in the community to sell against other dealers were occasionally mentioned. These dealers have failed to take into consideration the value of the pioneering effort that the utilities are putting forth. On the other hand, central-station companies should not, because of their strong position, adopt policies that would actually work a hardship on other dealers.



ELECTRIC REFRIGERATORS SOLD THIS YEAR, THE NUMBER IN USE AND 1927 SALES ESTIMATES FOR THE ENTIRE COUNTRY BASED ON DEALERS' STATEMENTS IN 154 LOCALITIES EMBRACING 26.6 PER CENT OF THE TOTAL NUMBER OF DOMESTIC AND COMMERCIAL LIGHTING CUSTOMERS

SERVICING METHODS

Central-station companies, except those operating on the resale plan, have their own service departments. In some localities where the distributor is in the same town the power company works in conjunction with the distributor, the utility maintaining a small force of service men to make minor adjustments and answer emergency calls. General repair or major complaints are referred to the service department of the distributor or manufacturer's branch. At present this arrangement obtains chiefly because the utility has not been able to build its service department to the efficiency of the distributor's. In the few places where the resale plan is operative the distributor's service facilities have worked out very well. Other dealers, where it is available, have found it advantageous to use the distributors' service departments, but as these are usually located in the larger cities, only those dealers in the immediate vicinity can benefit. Naturally, most dealers of all kinds have of necessity trained at least one man for service work. One distributor operating in a city of 200,000 has extended his service facilities to cover a radius of 50 miles and declared that it was working out to the satisfaction of his dealers.

Power companies are building their service departments to operate independently of the distributor or manufacturer except for his assistance in training and developing service men. In a number of localities the central-station company is servicing the refrigerator sold by other dealers, and in the smaller towns this practice offers possibility of development into a centralized service organization for all makes under one head. Quick and effective service is a highly important item, and future sales may depend largely upon the quality of service that is given on the first few hundred thousand units installed.

Training installation and service men has been a matter of deep concern to the utilities, distributors and manufacturers. Both manufacturers and distributors have performed a service for the industry in providing training courses for service men and salesmen at the factories, distribution centers and on the local properties. Central-station companies have had their men take the courses, which vary from three days to two weeks, some men going back for a second time. In one or two cases power companies have thought special training unnecessary and about the only experience the installation and service men had was a few hours with a factory man who made the first installation, left a few instructions and went on his way. Needless to say, these service men feel that they know little about the design or operation of the machine. Two weeks would appear to be the minimum training period and even longer might be desirable. Factory training has proved much more effective than local courses. What the training courses cannot hope to give is actual installation and

service experience in the field, and the more successful companies are having newly trained men serve as helpers for three months to acquire the necessary experience. Much depends upon a man's original mechanical ability, and it is also most desirable that he understand the fundamental principles of refrigeration. In the opinion of a distributor-dealer who has been in business for six years, it takes three years to make what he would call an "expert" refrigerator man.

Little uniformity was found in the number of service men required per thousand units in use. One distributor who stated that there were 7,000 units of that make in use in the locality employs but four service men, which he declared was ample. Some installations have been operating, he said, for five years without a single service call. The most uniformity was found among the power companies, several of which have adopted the practice of providing one service man for from 300 to 400 machines. One company that has sold 750 units has two service men and will add one for each 300 machines installed.

Servicing Experience

The servicing experiences of central-station and other outlets have proved to be the most checkered and contrasting element of the whole survey. They range from a highly satisfactory condition where service calls are scarcely known to such serious difficulties that the power companies or dealers have completely stopped the sale of electric refrigerating units. Nor are the difficult situations confined to any one make of refrigerator, as the same make that has caused endless trouble in one locality has been found to be giving well-nigh perfect satisfaction in another. The survey has emphasized an astonishing lack of data on service costs. Power companies, distributors and manufacturers should take immediate steps, if they have not already done so, to set up some means of recording the nature, frequency and cost of service calls. It is badly needed as a guide to installation and servicing practices and will serve as the best means of detecting weaknesses in design and construction.

Figures on the yearly cost of servicing per unit were not available with any degree of accuracy except in a very few instances. They varied all the way from nothing to as high as $35 or more, as announced by a badly disgruntled oil burner dealer. A distributor-dealer who has about 2,500 domestic units installed in his immediate territory quoted a figure of $2.34 per unit per year. This summer he had four service and ten installation men at work. A central-station company with 349 domestic units in operation had a total of 225 service calls from June, 1925, to June, 1926, with an average cost per call of $6.25. Of these units 244 had required absolutely no attention. A utility with 221 machines in service over a period of twelve and one-half months answered a total of 757 service calls—an average of $3.29 per unit. The cost per machine-year was $13.27. One utility believes that the refrigerators on its lines require about three service calls per year and to cover these has set aside $10 per machine.

Service costs are excessive in some cases, but the low figures given in several localities show that the yearly cost per unit should not be more than $5 maximum and that costs as low as $2.50 to $3 per unit per year can be attained.

Closely related with installation and service is the inspection of machines in use. Nearly all dealers make a practice of having service men call back on new installations from two to four times to be sure that they are operating properly. After that an inspection call is made every six weeks, and there was one instance of a dealer who makes regular calls every two weeks. Table IX shows the practice of 35 dealers whose frequency of inspection varied from two weeks to six months. Because of the newness of electric refrigeration and the well-known tendency of domestic customers to pay little attention to oiling or giving much if any care to electrical appliances, it would be desirable if all dealers would establish a practice of making either quarterly or semi-annual inspections. This, perhaps, need not extend indefinitely, but it is a precautionary measure that could well be taken during the next year or two.

Most Frequent Cause of Complaints

Various complaints were cited, some being peculiar to particular makes of refrigerators. They have been tabulated according to the nature of the complaint which the central-station company or dealer named as occurring most frequently or had proved the most troublesome. In order of their importance and frequency for the 28 different makes they were as follows: Leaks, float valves, odors, thermostat, expansion valve, belt, adjustment and general regulation, poor factory inspection, temperature control or regulator, noise, general poor operation, pulley, warping doors. Others mentioned less frequently were sweating boxes, mercury switch, sticky valves, stuck compressor, poor paint or enamel, blind gaskets. Virtually no electrical trouble was reported. Although poor factory inspection is rated eighth as a cause for complaint, many companies and their service men stated that the direct cause of many service calls was traceable to careless assembly and lack of inspection at the factory. Another cause contributing to increasing the number of service calls and their cost has been hasty or careless installation work.

Outstanding in nearly every instance has been the importance of careful installation and conscientious factory inspection in the elimination of complaints. It has been repeatedly stated that 95 per cent of the complaints can be attributed directly to one or both of these causes rather than inherently poor designs or bad mechanical construction.

The solution of the servicing problem lies in better and more complete training of installation and service men, scrupulous care in making installations and most rigid inspection and testing of units before they leave the factory. It should be said to the credit of the manufacturers that where their product has given trouble and the difficulty was recognized as due to poor workmanship or superficial inspection, the manufacturers have wholeheartedly accepted their responsibility and spared neither effort nor money to replace faulty units or put them in proper operating condition. Table X shows that the majority of dealers consider that the manufacturer's repair service has been satisfactory and only 30 dealers out of 304 had experienced difficulty in this respect.

Remote or Self-Contained Units

Where conditions are suitable, nearly all dealers prefer to install the compressor unit either in the basement or at some point away from the box. The advantages of the remote installation are usually

enumerated as elimination of noise, higher efficiency because of better circulation of air and lower surrounding temperature, greater accessibility for inspection or service and less likelihood of tampering by the user. In some localities where houses have no cellars it has been the practice to install compressors on the back porch. Back-porch installations of box and compressor have been discouraged in the Northwest because during the winter months some machines would not run long enough to freeze ice cubes. Of 292 dealers, 242 advocated the remote compressor, 40 favored the self-contained unit and ten had no preference.

Although there is a strong inclination toward the remote compressor, there are certain limitations to its application. It usually costs from $10 to $25 more to install than a self-contained unit. The self-contained unit has been found easier to sell, particularly to people who rent their homes. In apartment houses the installation of individual remote compressor units is often difficult. Remote installations are fixed and permanent, whereas the self-contained unit can be moved about readily. Whether or not an installation is to be remote or self-contained depends largely upon local conditions, but the prospect should be fully acquainted with the advantages of both, as there are numerous instances where it has been necessary to remove the compressor from the bottom of the box and place it in the basement. Dealers generally have criticised the national advertising by manufacturers that has featured the self-contained unit where 80 per cent of the installations are made with remote compressors. In the self-contained unit locating the compressor and condensing coils in the bottom of the box makes a very neat appearing cabinet, but because of better ventilation and accessibility, placing the unit on top has its advantages. There is a considerable demand for a small self-contained unit at an installed price under $200, which can be sold to apartment dwellers and to people of more moderate incomes.

PORTABLE TOOL BOX AND KIT USED BY REFRIGERATOR SERVICE MEN

MANUFACTURER-DISTRIBUTOR-DEALER RELATIONS

Practices, policies and relations from the manufacturer to the dealer have as yet to be worked out to the satisfaction of every one concerned. There are several weaknesses in the chain of distribution. The ever-present question of discount or lack of it is uppermost in the minds of many retail outlets. There are many factors, such as manufacturer's or distributor's sales, advertising, installation and service assistance, which act as variables in the discount received by dealers. A study of the key tabulation shows that discounts range from as low as 10 per cent to dealers acting merely as agents to as high as 45 per cent quoted by a department store, which is one of two such types of dealers that has made a real success in the sale of electric refrigeration. Table XII gives a general idea of the attitude of retail outlets toward the discounts they are receiving. From this it will be seen that a little more than one-third consider the discount satisfactory or "good"; almost one-half of the dealers viewed their discount as "fair" or qualified it with the statement that they were about breaking even or as yet there is no profit in the business, and about one-fifth emphatically declared that the discount was too low.

Among central-station companies there was almost unanimous opinion that so far there has been no merchandising profit, but this is accepted as part of the pioneering cost. Power companies felt that where they carry stocks, do all the selling, advertising, installation and servicing, a discount of 40 per cent is the minimum and 5 per cent more would be desirable. Other power companies operating on a 30 per cent discount but receiving considerable free sales, advertising and service assistance from the manufacturer or his distributor find that this assistance compensates for the smaller discount. There are a number of variations from these two, depending upon the set-up as to sales and servicing.

Other retail outlets, special dealers, electrical contractors and department and hardware stores were more inclined to view their discounts of 20 to 33 per cent, which they quoted, as too low. Such complaints were usually amplified, however, with further criticism of the manufacturers or distributors because of delayed shipments of repair parts or what the dealer considered inadequate sales and servicing assistance. Shipment of units or repair parts on a C.O.D. basis has been criticised by central-station and all other dealers.

Many dealers are also averse to paying anything for advertising material supplied by the manufacturer. There is need for education of dealers to enable them to get the most benefit out of the newspaper advertising and literature supplied by the manufacturer, part of the cost of which is passed on to the local dealer. Taken as a whole, discounts are none too liberal and might be increased in some places. It is of equal importance, though, that there should be a closer contact of the retail outlet with the manufacturer or his distributor. Efficient organization for sales, service and shipment are paramount considerations in creating satisfactory relations from manufacturer through to the ultimate user.

Sales and advertising assistance rendered each selling outlet by the manufacturers and delivery of units and repairs have an important bearing upon the relations between dealers and manufacturers. Accordingly, emphasis was given to obtaining expressions on these

items from the local selling outlets. In fairness to the manufacturers it should be noted that it was sometimes necessary to discount the statements of retail sales representatives because of exaggeration. Of 300 dealers, 139, or less than 50 per cent, qualified the manufacturers' sales assistance as good. On the other hand only 38, or about 12 per cent, were of the opinion that the manufacturer's, distributor's or factory branch's sales assistance was poor. This classification shows room for improvement on the part of the manufacturer.

The sales assistances given by the manufacturers and found most helpful are: Training salesmen, organization of special refrigerating departments, supplying sales manuals, demonstration helps, standard equipment specifications, sales stimulators, prizes, suggestions for sales meetings, frequent visits by specialized factory and territorial sales managers, co-operation during campaigns, help in campaigns, store and window displays, and methods of co-ordination of sales, installation and service departments.

Again referring to Table XIII, it can be seen that less than 50 per cent of the dealers declared that they were receiving good advertising assistance, whereas 13 per cent emphatically stated that the advertising assistance given them was poor. Although some of the

Table XV—Electric Refrigerator Dealers' Sales Estimates for 1927 in 154 Localities

Section	No. of Localities Analyzed	No. of Central Stations Selling Refrigerators	Central-Station Estimate	Estimate of All Other Dealers	Total	Central-Station per Cent of Total
East	41	34	10,700	28,660	39,360	27.2
South	36	29	8,810	16,550	25,360	34.6
Mid-West	52	46	12,515	35,975	48,490	25.9
West	25	15	3,260	8,550	11,810	27.6
Total	154	124	35,285	89,735	125,020	28.1

demands by the dealers were excessive in proportion to their importance as sales outlets, there were found to be considerable grounds for improvement on the part of the manufacturer.

Varying to considerable degree for different localities in the country, the delivery of units and repairs deserves no small amount of thought, especially at this time, which in the opinion of many is the critical period in the development of electric refrigeration for the manufacturer, the central station, the dealers and the public. With 70 per cent of the dealers declaring that they were obtaining good delivery on units and only 10 per cent believing that their deliveries were poor, a marked improvement on the part of the manufacturer is seen in comparison with conditions earlier in the year. In the light of improved production methods and increased manufacturing facilities now under way, there is every reason to believe that in 1927 there will be very few dealers postponing campaigns or receiving cancellations from customers because of failure to receive shipments.

Although the delivery of repairs has not reached the point where the dealers are unanimous in stating that they are getting prompt service, conditions are much better than in the past and show marked signs of improvement.

A better understanding of Table XIV will be conveyed by describing the interpretation of the three terms—organization, initiative and skill—as follows: By organization is meant the advertising, sales, installation and service set-up of the dealer at the time of the editor's interview. By initiative is meant the attitude toward the refrigeration business and the enthusiasm to develop a successful organization with the momentum obviously existing. By skill is meant the efficiency and ability to sell and service refrigerators as manifested at the time of the interview. A dealer or central station just starting in the business, with no previous experience, was not considered as skilled in refrigerator selling or servicing.

Each of these qualifications of the refrigerator outlets has been rated as good, fair or poor; the central station has been compared with all other dealers in each of the four geographical sections of the country considered throughout this survey; finally, the classifications have been totaled for the country and corresponding percentages figured.

Although the central-station companies lead in the percentage of outlets having good organizations, there is a smaller percentage of utilities with a fair organization and the same percentage with poor organizations as have all other dealers. In other comparisons of initiative and skill the percentages favor the central-station companies.

As previously mentioned, taking into consideration the length of time the majority of central stations have been active in electric refrigerator merchandising, in comparison with that of many other dealers, their accomplishment is remarkable.

General Situation with Respect to Past Conditions

A picture of the general situation with respect to the electric refrigeration industry for the country shows that conditions are improving; however, by studying the key tabulation, it will be seen that there are localities in each section where conditions are improving too slowly, are not improving at all or are even on the decline.

A study of the number of domestic and commercial electric refrigerators in use in the 154 localities analyzed in Table I reveals that for the country as a whole a saturation of only 1.78 per cent of domestic customers had been reached as of Aug. 15, 1926. Further analysis shows that some sections of the country have gone ahead much faster than others in the development of electric refrigeration; as, for instance, the South has the highest saturation, which may be partly attributed to the generally higher temperatures and the greater consequential demand for refrigeration. The principal reason for the good showing made in the South has been the generally good sales organizations built up by the central-station companies and the relatively large number of them actively engaged in the sale of electric refrigeration. They are working in close association with the manufacturers and distributors and the effect of this co-operation is being shown in sales volume.

In the West, where saturation of domestic customers is 1.15 per cent, development has been slower. Fewer power companies are active in selling electric refrigerations, and what might be classed as good utility sales organizations were the exception rather than the rule. Climatic conditions, particularly in the Northwest, probably have had some effect, but the support and influence of the power companies' selling are lacking. This condition was commented on frequently by distributors and retail dealers, and the wish was expressed that the local utilities would take a more active part.

Saturation in the East and Middle West is affected by the high proportion of renters in the larger population centers, where most of the selling has been done in the suburban areas and in equipping apartment buildings.

ENERGY CONSUMPTION

The kilowatt-hour consumption of domestic units ranges from a low point of 450 kw.-hr. per unit per year in the Middle West to a maximum of 1,200 kw.-hr. per unit per year in the South. The variations were approximately proportional to the size of the unit and the temperature prevailing in the locality. Little data were available on the consumption of commercial units, some companies stating that a commercial installation returned about twice the revenue of a domestic installation. Power companies have found that installation of the domestic refrigerator can be counted on to double the revenue received from a residential customer. Cost of energy to operate electric refrigerators has not seriously affected sales, but the need for uniformity in rate structures and a type rate that will encourage use has again been emphasized.

MARKET POSSIBILITIES AND SALES ESTIMATES

In the opinion of utility executives the present market for domestic electric refrigeration is from 10 to 30 per cent of the residential customers. It is significant to note that family income cannot be taken as a hard and fast criterion of a customer's ability or inclination to purchase an electric refrigerator. It is an important element in a market survey, but many companies that have arbitrarily set up a prospective list of customers with incomes of $5,000 or more have had their calculations upset by sales to a number of customers with incomes of less than half that figure. It is also a mistake to judge the number of potential purchases by the percentage of homes now using ice. There will always be a large field for ice refrigeration, and much will depend upon education of the public to the use of ice as well as electric refrigeration.

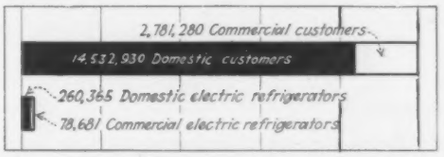
Considering that 30 per cent of the domestic customers may be regarded as legitimate prospects for electric refrigeration would mean that there is in the United States today a possible market for about 4,500,000 units. It is a question how many years would be required to reach a 30 per cent saturation, entirely disregarding the number of new customers that will be added from year to year. The existing sales, installation and service organizations will this year sell close to 250,000 domestic and commercial units, but at that rate would require eighteen years to sell 4,500,000 units. Dealers of all classes are increasing their sales forces and the estimated sales for 1927 by all dealers as shown in Table XV for 154 localities is 125,020. This is about two and a half times the number of units sold during the first seven and one-half months of 1926. Based on the estimates of these dealers, the existing dealers in the whole country expected to sell a total of 470,502 units in 1927. Of this number the estimates show that about 28 per cent will be commercial and 72 per cent domestic. This figure does not take into account the appointment of additional new dealers or the entrance of power companies not now selling electric refrigerators but which have expressed the intention of organizing for their sale. What next year's total sales will be depends upon the extent to which manufacturers, distributors and retail outlets can expand their sales, installation and service organizations. These must be recognized as the neck of the bottle through which manufacturers' production must be squeezed. It should be comparatively easy in 1927 for all outlets to sell at least 500,000 units. Actual sales will probably reach 750,000, and unless some unexpected condition arises such as a business depression or there is a recurrence of delayed shipments and extraordinary servicing requirements the latter figure may be exceeded.

CONCLUSIONS OF SURVEY

Summarizing conditions and trends resulting from an analysis of the tabulated reports and weighing the opinions expressed by utility executives, distributors and all the selling outlets interviewed, the following conclusions with some suggestions can be made:

1. Electric refrigeration as a practicable and satisfactory service to the home has definitely arrived. There are a number of high-class machines now on the market that the central-station company can conscientiously recommend and sell to its domestic customers.

2. Utility executives are well convinced of the value of this load and regardless of the factors that have influenced local situations such as non-merchandising policies or conservatism toward the new development central-station companies should take immediate steps to promote the sale of electric refrigeration in its territory either by the organization of a special refrigeration sales and service department or more effective co-operation with local outlets. Sales programs for 1927 should be completely mapped out before the end of this year.



SATURATION OF DOMESTIC CUSTOMERS IS 1.78 PER CENT AND FOR COMMERCIAL CUSTOMERS 2.88 PER CENT

3. Central-station companies are the best existing retail outlets for a number of reasons: They are vitally interested in the development of electric refrigeration; they have sales and service departments that lend themselves readily to the business; they have a large prospect list ready made in their domestic customers; they can finance their own time payment paper, and they are a strong influence in recommending a new service to the public.

4. So far as can be ascertained, the ice industry has not actually suffered by the advent of electric refrigeration. Central-station executives as a whole have met the ice manufacturer problem openly. Little or no trouble has developed where the utility and the ice companies have got together and talked things over. Avoidance of the issue usually aggravates the situation, which should be ironed out at the start. There are indications that progressive ice dealers are slowly coming into the sales picture.

5. Commercial refrigeration is separate and distinct from the domestic field. It is being handled largely by manufacturers' branches and specialists but offers a large field for development by special commercial refrigerator salesmen. More thorough engineering of small commercial installations is needed and in cities large enough to offer sufficient market the central station should have at least one man solely for commercial work,

6. Simplification of refrigerator equipment is important, including the reduction of piping joints. Accessibility for inspection, repair and oiling will tend to reduce the number and cost of service calls.

7. Thorough factory construction is vital to satisfactory operation in service. Every machine should pass a rigid inspection, including a running test, before leaving the factory, even if it requires some sacrifice in quantity production. Quality should not be sacrificed for production.

8. Careless or hasty installation work results only in multiplying complaints. Proper installation will eliminate the majority of complaints, and a little more time spent on this work pays big dividends in reducing subsequent service cost. The right kind of installation work has been found to be the answer to 95 per cent of the complaints.

9. A first-class service organization is essential. Electric refrigeration is still on trial in the public mind, and the future of the business may depend upon the quality of service rendered during the next year or two. This does not necessarily mean free service, but good service, even if charged for after a stated period.

Table XVI—Dealers' Sales Estimates for Entire Country for 1927 Based on Ratio in 154 Localities

Section	Total Number of Customers	Total Number of Refrigerators Central Station	All Other Dealers	Total
East	5,802,330	45,026	120,688	165,714
South	2,178,170	34,079	63,820	97,899
Mid-West	6,343,500	41,233	118,623	159,856
West	2,990,021	12,947	34,086	47,033
Total	17,314,210	133,285	337,217	470,502

Table XVII—Domestic and Commercial Electric Refrigerator Sales by All Classes of Dealers for the Entire Country Based on Ratio in 154 Localities, Jan. 1 to Aug. 15, 1926

	East	South	Mid-West	West	Total
Domestic refrigerators	60,041	23,751	62,587	18,908	165,287
Commercial refrigerators	5,494	5,929	12,324	3,542	27,279
Total sales for seven and one-half months, 1926.	65,535	29,680	74,911	22,450	192,566

10. Guarantee periods, including free service, range from three to fifteen months. There is a tendency on the part of manufacturers' branches to shorten the free service period to three or six months, whereas the guarantee on defective parts runs for a year. Central-station companies are generally extending the free service for longer than a year, and where long term payments are offered service is usually extended to cover the period of the payments.

11. Service costs are too high, in many cases running from $12 to $15 per unit per year. This has been caused by a combination of circumstances—inexperience in making installations, inexperienced service men, poor factory inspection. Service cost should not exceed $5 per unit per year, and $2.50 to $3 is attainable. The cost per unit will decrease as saturation increases. Some distributors are handling service calls with one service man for every 1,000 domestic units installed. Central-station companies are finding that one service man can take care of the service work on 300 to 500 units. A compact or a scattered territory is a determining factor.

12. Training for service and installation men has generally been inadequate. One or two weeks is too little. Two weeks' or a month's training with two or three months' work as helper is required to make a first-class installation or service man, provided he has an aptitude for the work. Manufacturers' training schools conducted at the factory are much more effective than training courses conducted at the local utility.

13. Many service calls are unnecessary and often result from failure of salesman or installation man to explain the operation of the unit to the customer. Overselling by salesmen with respect to time required to freeze ice or method of making frozen desserts results in disappointed users who expect impossible performance. Proper selling in the first place and tactful servicing of such complaints cannot be urged too strongly. In the majority of cases service calls drop off sharply after the first month's use when the customer has become familiar with the refrigerator.

14. Periodic inspection every month or six weeks after a unit is installed is made by a number of dealers. This is a commendable practice, particularly at this time. However, if continued, it will impose a heavy burden upon service departments. Quarterly or semi-annual inspections should be sufficient, and some companies are considering the possibility of offering users a flat charge per year for maintenance after expiration of free service period, if they can determine a fair figure for this work.

15. Accurate data on number of service calls and costs are woefully lacking. Power companies and also dealers should set up some method of keeping service records in order to guide them in service practice and with a view to offering customers an inspection and maintenance service at a nominal charge.

16. Central-station companies and dealers who are setting up systematic sales and service organizations are getting the best results. Hit-or-miss methods result in chaos, disappointment in sales volume, dissatisfied and disgruntled customers, and high sales and service costs. Selling electric refrigeration is a highly specialized business and should be conducted by a special department further subdivided as to domestic and commercial sales. Use of special refrigeration salesmen by the central-station company is to be preferred to using the general sales forces, which tends to detract from other commercial activities. Continuous selling in so far as the seasonal nature of the business will permit is most desirable in order to retain an efficient year round selling organization and flatten out the sales curve. Campaigns have proved effective in stimulating sales, but tend to put too heavy a load on the installation department, and some companies have found that campaigns have caused them to undershoot their total sales quotas for the year.

17. High-type specialized salesmen are required, and men of some maturity are better than youthful salesmen. Compensation should be fair and liberal, always with the knowledge that low salaries or inadequate commissions beget poor salesmanship. Electric refrigerator selling is a man's job and requires a lot of intelligence and stamina. One to four weeks' training of salesmen is desirable, and it takes from one to three months for a new man to hit his stride.

18. Much of the electric refrigerator business to date has been on a cash basis, but the past summer has seen a wide adoption of time payment plans. Terms extending over 24 and even 36 months have been offered, but

too liberal terms may have a bad reaction later in view of price reduction and new models. Twelve months would be more desirable; however, 18 to 24 months fits in better with the family budget.

19. Principal sales resistances encountered in order of their frequency were first cost, doubt of final development and expectation of further price reductions. Some utility companies are awaiting stabilization of prices and conviction that present design is fundamentally correct. Electric refrigerator manufacturers should consider these elements and their effect upon the market.

20. Income limitations of prospects do not entirely control the market. It is not an important consideration now when the very top of the cream is being skimmed, because reports indicate that at least 20 to 30 per cent of domestic customers may be considered as legitimate prospects. The wealthier classes have not proved as good prospects as people of smaller incomes. This has been surprising and calls for a different kind of selling.

21. Trial installations to stimulate sales are anathema to many agencies, which maintain that this is weak selling. Experience has shown that when this is done cautiously only 6 per cent of the trial units had to be removed. Where due consideration is given to customers' responsibility and conscientiousness of salesmen, the trial period is a valuable sales argument but cannot be offered indiscriminately.

22. Price cutting is a two-edged sword and once started in a locality has a cumulative and increasingly bad effect upon all dealers. Co-operative associations of refrigerator dealers have helped this situation in some cities. There is plenty of business for all, and they would do well to adopt a standard code of ethics and practice. Accepting old boxes as trade-ins is practicable only in communities where they can be sold to the poorer classes that do not now use ice. This can be used as a means of extending the ice manufacturers' business. Excessive allowance on old boxes to close sales is a pernicious form of price cutting and detrimental to the electric refrigerator business.

23. Distributors and dealers claim to have made little or no profit this year. There is a wide demand for better discounts, and 40 per cent off list is thought to be about right where machines are purchased, stocked, handled, sold and serviced by the retail outlet. Manufacturers rightfully point out that electric refrigerators are not "shelf merchandise" and dealers can expect to make real money only through sales volume. It was most noticeable during the course of the investigation that those dealers that were the most aggressive and that were making the most intelligent use of the manufacturers' sales assistance were making the most sales and had the least complaint to make on discounts.

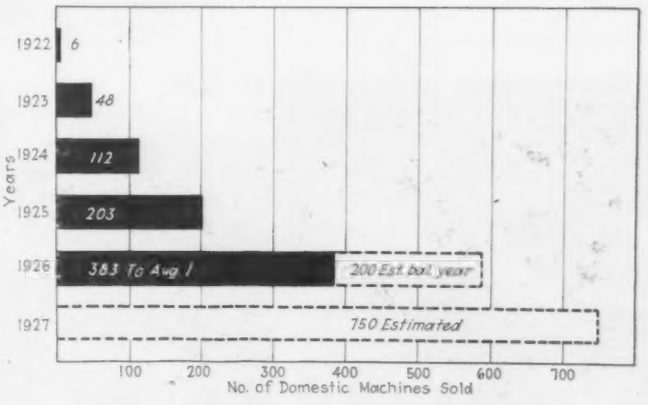
24. C.O.D. shipments of units and repair parts rankle many responsible dealers in addition to working a financial hardship at times. Selling electric refrigerators requires considerable capital, and manufacturers should endeavor to appoint dealers for whom these terms would not be difficult or whom the manufacturer would be willing to carry for a period of 30 days at least. Closer co-operation between the dealer and manufacturer's branch in the use of sales assistance would go a long way toward eradicating discussion of this item.

25. Better shipments of units by the manufacturers and more prompt attention to shipment of repair parts and calls for service assistance are wanted by dealers. This situation, however, already shows marked improvement all along the line.

26. Retail dealers should give more attention to the location of their stores as well as the appearance of windows and sales floors. Side streets and untidy shops do not accord with the sale of a product the major selling points of which are cleanliness and the hygienic preservation of foodstuff.

27. Distributor-dealers, central-station companies, special or exclusive dealers and electrical contractors have proved the best outlets for the electric refrigerator. It is not yet ready for distribution through already established channels such as department, furniture or hardware dealers. Resale plans being formulated by some manufacturers may be attractive to this class of merchants.

28. Naming prices f.o.b. factory has caused bad reactions and hampered sales, but it seems impossible to suggest a better method that would be equitable to every one concerned. In this connection it is believed



YEARLY SALES DOMESTIC ELECTRIC REFRIGERATORS BY ONE CENTRAL-STATION COMPANY

by dealers that national advertising has sold the idea of electric refrigeration better than local newspaper advertising, which can be accounted for by many dealers' failure to accept the manufacturer's plan for local advertising.

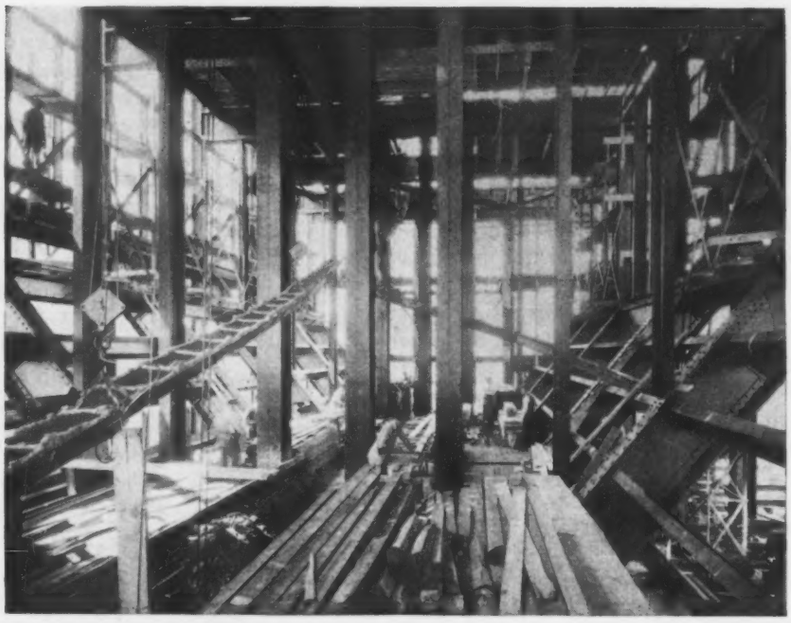
29. Remote installations are preferred by most dealers, who state that national advertising should not feature self-contained cabinets so heavily. There are limitations to remote installations, and the self-contained unit has a big field in apartment houses, for renters and people who insist on being able to move their refrigerator about. There is also a demand for a small, low-priced, self-contained unit.

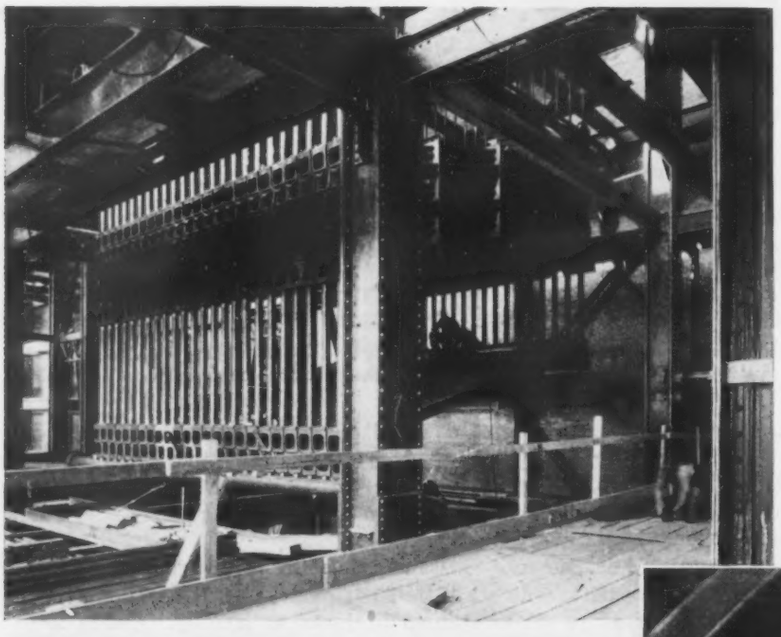
30. The ice cream cabinet business has gravitated toward the dairy and ice cream wholesalers. Where they are not providing this service to their customers, it presents a profitable market.

31. Electric rates for refrigeration service have not influenced sales, but dealers should refrain from comparing rates effective in different localities. The need for uniform rate structures designed to encourage use is again apparent. It is generally believed that the rate per kilowatt-hour should not exceed 6 or 6½ cents and that 5 cents is about right.

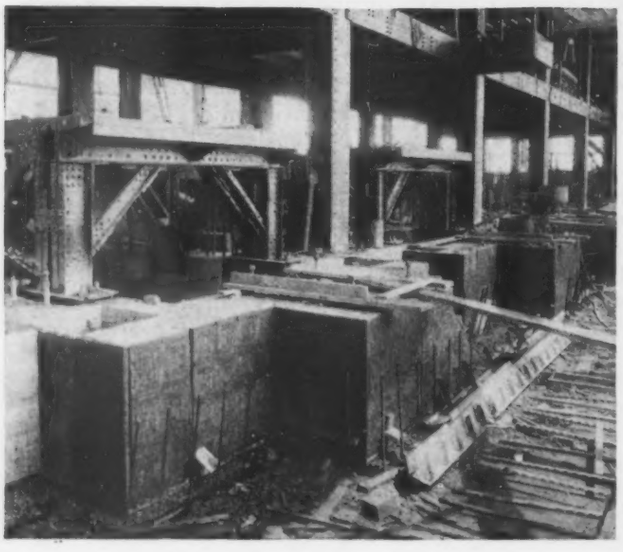
32. The public generally has accepted electric refrigeration, but wants to be shown, and sales next year will be governed pretty much by the capability and capacity of the sales organizations that can be made effective.

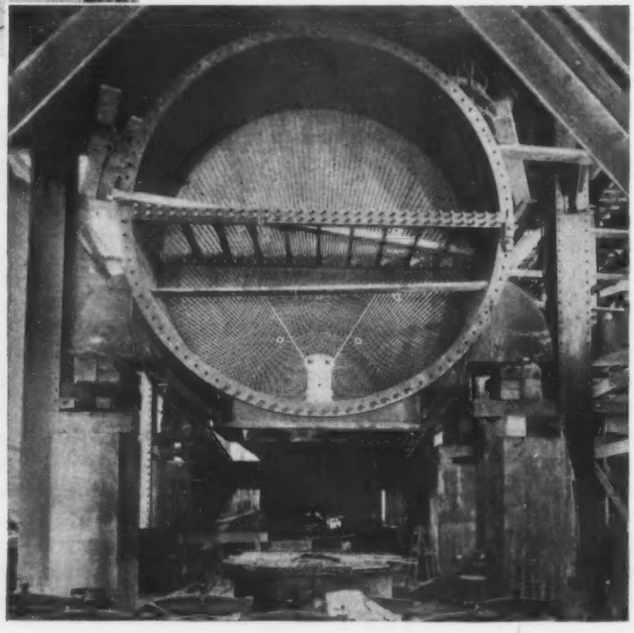
East River Station During Construction



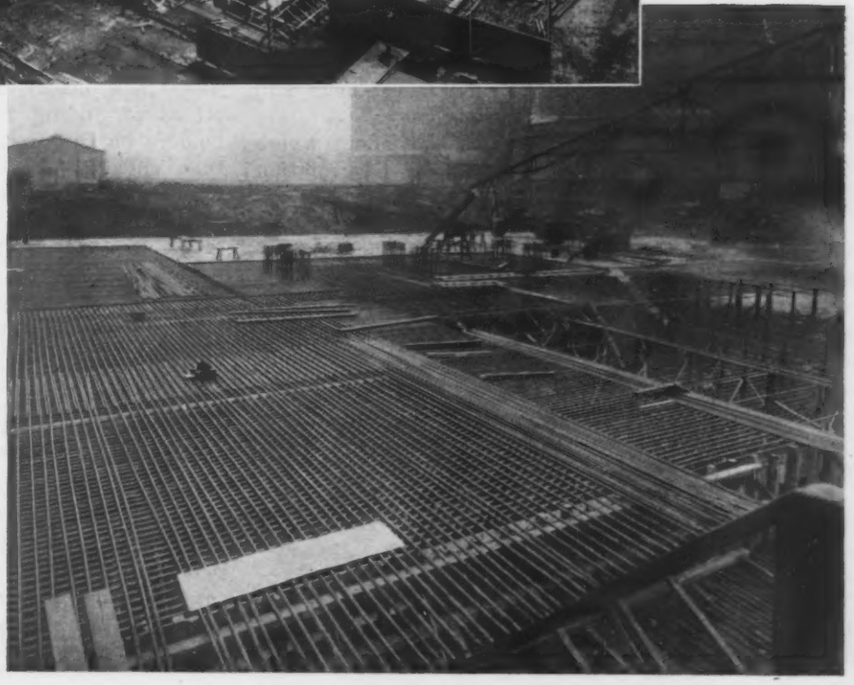


STEEL construction of the coal bunkers in the pulverized-fuel plant of New York Edison's new East River station is shown above. At the left is a tube deck of one of the 1,550-hp. boilers which will produce steam at 375 lb. and 700 deg. Fahr. Interdeck superheaters will be used. The four walls of the furnaces will be faced with steel water tubes to permit the use of high-combustion chamber temperatures without wall deterioration. In the lower left corner are foundations for the coal pulverizers, surrounded with cork to prevent transmission of vibration to building. Below is one of the 47,000-sq.ft. condensers to be used with 60,000-kw. turbo-generators.





Foundation Construction at the East River Station



ELEVEN HUNDRED piles could be driven from one position of the pile-driver traveler at the East River station of the New York Edison Company. The travelers were mounted on 44-ft. tracks. In the center view of the foundation can be seen the 6-ft. cast-iron condenser circulating water pipes, which are a feature of this station. These individual intake and discharge pipes for each condenser's cooling water are intended to permit flexibility of operation not afforded by the customary construction. Below are shown reinforcing rods laid ready for pouring the concrete foundation of the station.

Ripley Urges Investigation of Utilities

Harvard Professor of Economics Makes Analysis of Financial Operations of Power and Light Companies—Asks Immediate Examination of the Whole Field by the Federal Government

"MORE Light—and Power Too" is the curt and rather noncommittal caption under which appears in the November issue of *Atlantic Monthly* a very searching analysis of the public utility industry in the United States. Without mincing words, William Z. Ripley, professor of economics at Harvard University, charges the industry with the practice of certain unethical and decidedly dangerous policies and suggests methods to curb these practices.

Following a somewhat similar attack in the same magazine a few months ago on the alleged abuse of non-voting stock and the obscurity of financial statements, the current article deals with various phases of financial reorganization, especially in the light and power industries, demanding an immediate federal investigation of the whole field.

Admitting the manifest advantages of legitimate concentration of capital, both from an operating and from a financial viewpoint, Professor Ripley charges the industry with violation of certain more or less established financial principles. These principles are concerned with the following practices:

1. The pyramiding of control through loading ownership with non-voting stock.
2. Closing of the open market to new issues through single banking affiliations.
3. Payment of parent company dividends when subsidiary dividends are in arrears.
4. Deliberate obfuscation of reports—publishing one set of figures for shareholders' consumption and another for stock exchange purposes.
5. Paying dividends on the basis of future profits, resulting sometimes in vanishing returns.
6. Capitalizing companies out of all proportion to existing equities.
7. Paying holding-company dividends on the basis of profits from financial operations such as the issue and sale of stock for subsidiaries.
8. Issuing new securities for new equipment where allowance from earnings in the form of depreciation and replacement reserves should have been made.

In fairness to the industry, Professor Ripley commences with the admission that the present state of centralization of control and the alleged maze of interrelations of companies out of which arise most of the abuses charged are due largely to the diversity of state laws—an outcome of the federal system of government. "Corporations are oftentimes compelled by the diversity of state laws to resort to these artificial arrangements—albeit perhaps not without a modicum of quiet satisfaction that our conflicts of laws are so badly permissive of profitable indirection." Certain privileges which do not exist in the home state of the corporation can be secured through holding a charter elsewhere. Indiana, for example, requires a vote of 75 per cent of the shareholders of a company to validate a mortgage. When this presents difficulties a charter is obtained, say, in Virginia, creating "an intermediary corporation which proceeds, not to mortgage the property, but to mortgage its holdings of stock in the corporation which does hold the property."

CONTROL BY BANKING INTERESTS

Most of the alleged abuses with which Professor Ripley is concerned have, he claims, crept into the industry since the assumption of control of certain utility groups by investment banking interests whose controlling common stock represents practically no actual investment, at least in the first instance. This gives rise to what the professor terms "prestidigitation, double-shuffling, hornswoggling and skullduggery." In other words, a myriad of adjustments and exchanges of stock have been carried out, evidently with the approval of the shareholders, which have altered the whole structure.

One of the results of this banking control is the closing of the open market for new securities to competitive financing through close affiliations made between utility groups and a single banking institution. This is not characterized as an evil in itself but may give rise to abuses. A practice which appears under financial control is the policy on the part of holding companies of paying dividends on their own shares while some one or more subsidiaries may actually be in arrears or may have operated at a loss. Then there is the temptation to extend beyond what is usually regarded as the natural province of utility operations. Such examples are cited as the fruit properties of American Water Works & Electric and the oil interests of the Standard Gas & Electric and Cities Service. Here Professor Ripley reverts to the question of providing for the shareholders adequate information on the properties operated. In the case of Cities Service emphasis is placed on the large proportion of earnings arising out of oil development, and the question is raised as to whether the company is a utility or an oil-producing concern. The ethics of adding thousands of new customer shareholders on the argument of stable utility records and then engaging in the most speculative enterprise in United States business is seriously questioned. Taking the same company as an example, Ripley attacks the inadequacy of holding-company statements and the policy of providing one set of information for the use of the shareholder and another for stock exchange purposes. These statements, it is pointed out, afford no basis for allocating costs and for determining earnings as related to the investment. This makes fair rate regulation practically impossible.

SALE OF STOCK TO CUSTOMERS ABUSED

But it is not only in connection with control by banking houses that abuses creep in. According to Professor Ripley, the lack of conservative banking advice is frequently sorely felt. Apart from the unduly large percentage of obligations in the capital structure of many utilities which market their securities direct to their customers or employees, preferred stock is some-

times issued to the extent of the entire margin between feasible bond issues and the full value of the property. The vast possibilities discovered in exploiting customer ownership are often used to the limit and beyond. Some sort of regulation is urged in connection with these issues.

Another virtue which has its attendant vice is the practice of asking the holder of bonds in a local operating concern to exchange these, in the name of capital simplification, for shares of the newly created finance corporation. The position of the holder is thus shifted from that of a preferred to that of a junior claimant upon earnings. Such stock is usually termed cumulative preferred, and is, according to Professor Ripley, neither bonds nor stock, but something midway between the two. Securities of this kind are subject to the risk of vanishing returns and to the possible emission of new prior securities. It is not suggested that the issue of such securities be prohibited, but that their volume be definitely limited.

Another phase of the same situation has to do with the issue of collateral trust bonds by holding companies. Since these companies must depend on subsidiary earnings, they mortgage the income from their investment in the shares of their subsidiaries, through an issue of collateral trust bonds, secured by the deposit of such securities with a trustee. Such bonds, it is pointed out, are no true bonds, since they are not mortgages on actual property. Nor are they the only funded debt of the company as is frequently advertised. The suggestion here also is a definite limit to the volume of the issue.

Evil of Vanishing Returns

What may be considered the focal point of the whole attack is what Professor Ripley calls sensitive or vanishing returns. In the pyramiding of company upon company the equity upon which profits are earned becomes smaller and smaller the higher the pyramiding goes. The very apt comparison is to the nozzle of a hose pipe. During a period of prosperity all is well. Profits are magnified. On the down swing of the cycle, however, a very serious situation may easily arise. If the subsidiary company has no senior securities and all its stock is owned by the holding company, all is well. A gain or loss is passed on *in toto* to the parent. But when a subsidiary has already mortgaged say 50 per cent of its income for return on bonds or preferred stock, a marginal fluctuation in operating earnings is focused upon the unpledged balance—the junior securities of the subsidiary. A shrinkage of one-tenth in income would thus fall on the junior dividends, reducing them by one-fifth rather than one-tenth. A drop in operating earnings thus reduces dividends available for parent-company shareholders in geometric ratio. Where there are several companies in the set-up, the thing increases geometrically as it goes. It is subject to actual measurement, and a table is given by Professor Ripley pointing out what reduction in earnings would be necessary to wipe out parent dividends. At the top of the list of companies chosen is Columbia Gas & Electric, in connection with which a 79 per cent drop would be required. At the bottom of the list is American Water Works & Electric, in which a 12 per cent reduction, it is alleged, would wipe out parent dividends. Potentially, there is a serious danger, Professor Ripley feels, in the situation, especially since the utilities cannot adjust rates upward or downward at will as can most manufacturing concerns. Complicating the problem is the confusing financial set-up in the case of such companies as Associated Gas & Electric and Cities Service.

Stock-Watering Problem

While stock watering or the overissue of securities in proportion to the actual investment does not increase rates, as was commonly supposed some time ago, it dilutes credit and may easily impair the service rendered. For this reason, according to Professor Ripley, it is a matter of public concern. The suggestion here also is that there should be some sort of supervision to see that capitalization is not out of proportion to equity. One of the chief causes of such overissues is the keen bidding which exists for independent properties either for strategic purposes or for profit for an immediate turnover. Professor Ripley cites an instance where a company with a par capitalization of $1,600,000 recently refused an offer of $5,000,000. There are promoters in the field—not utility men at all—who are willing to pay exorbitant prices for properties which they know other interests wish to purchase. These they hold for higher prices if a quick turnover is not possible. The promotion of the Northeastern Power Company is instanced.

Then there is the general desire of management to make income statements appear as attractive as possible, and this results, Professor Ripley finds, in an irresistible impulse to pad income accounts when a further sale of securities is contemplated. Such issues are usually undertaken in periods of good business, and there is the tendency to bank on future prospects. There is a temptation to "puff up the income account by crediting profits on intercompany transactions within the system, or to reappraise assets on a rising scale of general prices." All this tends to produce a top-heaviness and instability, especially with the weaker companies. There are, as usual, certain exceptions. Companies like Columbia Gas & Electric and General Gas & Electric have reduced their obligations or lowered the value of their capital stock.

Related to these practices is a policy which Professor Ripley finds questionable—paying holding-company dividends on the basis of profits made by issuing securities for susidiaries. As an instance, Middle West Utilities reports an income for 1925 or $5,842,000, of which $3,265,000 arose out of the sale of securities to subsidiaries and others. Doubt is cast upon the justification for putting these items in profit account at all, and also upon the probability that this can continue year after year. Instead, either dividends must fall or rates must go up. The process is compared to lifting oneself by the bootstraps.

Depreciation and Renewal Provision

A question upon which Professor Ripley places considerable emphasis is provision for depreciation and renewal. The president of the Detroit Edison Company is quoted as holding the view that each item of property has a definite life and that provision for its reproduction should be made through a reserve charge against income, without resort to a new issue. Professor Ripley finds that an unfortunately large number hold the opposite view. The conclusion drawn is that advance in technique will one day necessitate the scrapping of all present plant and equipment and that truly conservative managers will have already made provision for this from current income.

All these allegations lead up to Professor Ripley's main conclusion and recommendation—that state commissions are powerless to deal with the interstate problems involved. At present where hydro-electric generation is concerned the Federal Power Commission may assume control in cases where no competent state regulation exists. The suggestion is made to enlarge the scope of this body, enabling it to supervise all interstate light and power business.

The concluding paragraphs of the article revert to the alleged real reason behind customer ownership—the ability to tap an almost unlimited reservoir of new capital without paying commissions to bankers. This leads to dangerous practices falling below the level of trusteeship. Exorbitant prices are reported to have been charged to uninformed customer buyers of stock. What if one of these huge companies should fail? The need for federal supervision or control, says Professor Ripley, is evident. No one, he admits, knows the whole answer. Two minor suggestions are the disfranchisement of the stock of operating companies deposited as collateral for superimposed issues of holding companies and standardized reports by interstate companies—in any event restraint on the ill-intentioned few. Here lies the application of the title to the article. What is needed is light and information on the actual conditions—and power to deal with them in the hands, say, of the federal government, concludes Professor Ripley.

Letters from Our Readers

Grounding of Secondaries and Transformers

To the Editor of the ELECTRICAL WORLD:

In reply to "X.Y.Z.'s" recent letter (page 806, Oct. 16) in connection with grounding the neutral of secondary circuits, I must say that it does not seem possible that any one in the electrical industry today can question this procedure. However, I do agree with him that grounding the case of a transformer on a pole adds a very undesirable hazard and should not be done.

A neutral ground properly installed and protected with wood molding adds very little to the danger of a lineman. This is especially true if proper spacing is maintained so that the lineman will be above the secondary. If this is not possible, as when cross-arm construction is used, proper pigs and blankets should be used. A lineman can protect himself if he is thoroughly trained in safety methods and is not allowed to take a chance. I must admit that "X.Y.Z.'s" statement about the number of linemen killed is true, but I believe it is caused by a let-up in safety precautions rather than by the neutral being grounded. Did "X.Y.Z." ever work on a treated pine pole? If so, he should know that there is not a great deal of resistance between him and ground.

Now, the point is, we can and must train the lineman to handle "hot stuff" safely. But what about the untold thousands of women who stand on a damp basement floor and turn on an electrical appliance? What switch or appliance is made to withstand 2,300 volts? The possibility that a tree may bring a primary line across a secondary is too great to ignore. Sooner or later a fatal accident would be the result.

I do not know whether I am more fortunate or less fortunate than "X.Y.Z.," but I have had three experiences and I don't want any more. One was from the failure of a transformer following a lightning storm when a woman attempted to turn on a light in her bathroom. Another time a tinsmith allowed a small piece of tin to fall from a roof and it fell across primary and secondary. A man's life was lost before this condition was discovered. The third accident, which happened very recently, was caused by the limb of an apple tree bringing primary and secondary together, and again a customer's life was taken. In all of the above cases the accident would have been prevented by proper grounding, as there was a fuse just ahead of each point of contact.

Now, in view of such occurrences, how in the world can any one say that grounding is anything but necessary? And one ground is not enough—"X.Y.Z." is right there. The more grounds you have the better off you are. Not only ground at each transformer, but see that every service is grounded, and don't let any small-town municipal authority tell you not to ground to water pipes. Go ahead and do it and get ahead of the water meter. It will not hurt the pipes. Anyway, who would not rather pay for a few pipes than have a life lost? J. M. F.

Alliance, Ohio.

Refinements for Oil-Switch Operating Mechanisms

To the Editor of the ELECTRICAL WORLD:

The article on "Requirements of Oil-Switch Operating Mechanisms" by Roy Wilkins, which appeared on page 753 of your issue for Oct. 9, raises a number of interesting questions.

The first is, Why is the construction of oil circuit breakers usually such that the moving contacts move in a vertical direction instead of horizontally? It would seem that the latter arrangement is more favorable in that it provides a chance for the heavier oil to displace the lighter arc gases more quickly. The arc would thus be elongated and ruptured more quickly with less energy converted to heat in the tank and the effects which accompany the operation of the breaker would be less violent. The hot gases from the arc would likewise be expelled more quickly.

The second question is, If the inertia of the oil does not permit the effect of buoyancy to come into play with sufficient rapidity to be of service, why have arrangements which deliver a strong current of oil across the arc at the moment of operation, or even continuously, not come into use?

The third question is, Why have arrangements designed to deliver an upward puff of air under the arc at the moment of operation not come into use in connection with air-break switches? The difficulties of supplying such an arrangement would seem to be of a minor nature and the advantage great.

The fourth question is, In connection with oil switches, why has so little attention been paid to the possibilities of the magnetic break as a means for stretching out and extinguishing the arc more quickly than the natural buoyancy and cooling will accomplish it? The difficulties of applying the magnetic break seem to be considerable, but it provides the possibility of applying a powerful force to the arc gases and then moving them out of the way quickly.

As the switch and circuit breaker problem is today a pressing one, it would seem that anything which promises improvement in the existing situation would be of value. It is hoped that the above questions and remarks may focus attention on some possibilities or bring better ones to light. A. F. PUCHSTEIN.

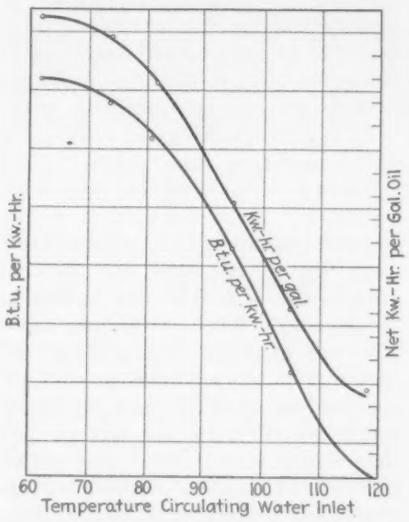
Ohio State University,
Columbus, Ohio.

Central Station and Industrial Practice

Basis for Comparison of Station Results

BY J. R. DOWDELL
Assistant Engineer Houston Lighting & Power Company, Houston, Tex.

IN ORDER to establish a basis of comparison by which to judge station operating efficiency, basic results are expected from theoretical operation of the plant under average operating conditions. Curves like those shown in the accompanying illustration are obtained by this method, being based on the varying temperatures of the circulating water, which control the greatest variable that affects the station economy. These curves have been revised three times in the past ten years to agree with increased station economy, the data for one year showing 19 per cent higher economy than the previous year. Consequently these curves are not of permanently stable value and are obviously arbitrary in that other variables affect the station economy. However, they provide an ideal or goal toward which the operating force can direct its efforts.



AN ARBITRARY BASIS FOR STIMULATING PLANT ECONOMY

Among other variables that affect station economy, which are not directly under the operator's control but which would have a serious effect on the final result, are:

1. Variation of fuel quality. Fortunately the fuel oil has very uniform quality; therefore for daily operation no allowance is made in these curves for variation in fuel quality.

2. Weather conditions, load and character of machines available, also beyond the control of the operator but controlling factors in affecting station economy.

However, the operators can control the station efficiency through the efficient operation of boilers, turbines and station auxiliaries, the prevention of fuel loss by reporting all leaks in station piping and valves, the prevention of power loss through unnecessary operation of station auxiliaries, lights, etc., proper distribution of load among machines, reporting inefficient machines and apparatus, and close supervision and attention to all station equipment for operating defects.

Tap-Changing Switch for Use with Relays

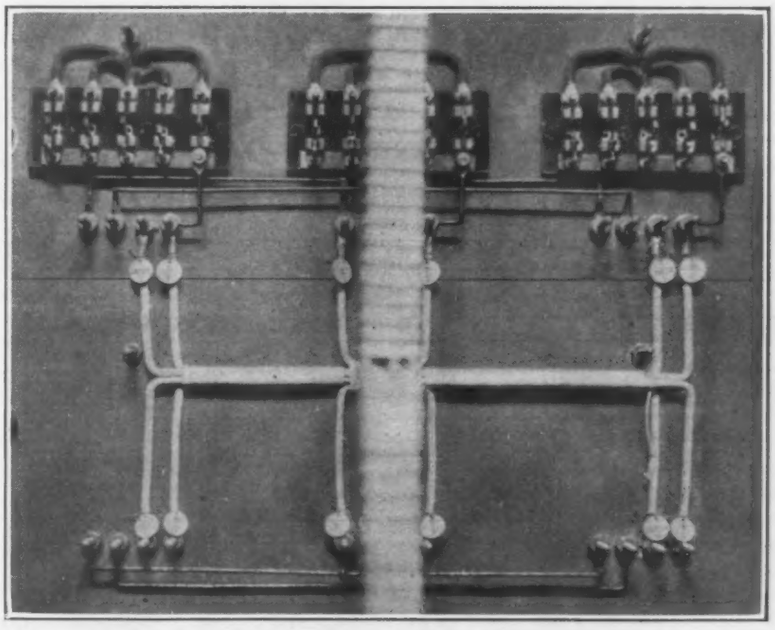
WHENEVER it becomes necessary to change relay taps frequently, the leads can be brought out of the relay and connected with some kind of a switch to accomplish the desired result. At the Mitchell Dam plant of the Alabama Power Company this was done because screws in the type IA relays were frequently stripped from changing taps at frequent intervals, resulting in loose connections. The switch shown in the accompanying illustration was designed to do this tap changing, and no further trouble has been encountered.

Standardizing Substations

BY E. D. FREEMAN
Oklahoma Gas & Electric Company

ON A large transmission system supplying small towns and requiring sectionalization it is advisable to standardize substations as much as possible. It is also advisable to keep the cost of such stations to a minimum consistent with giving good service. The Oklahoma Gas & Electric Company engineers have developed types of substations embodying these ideas for use on its large 63-kv. system.

In Fig. 1 is shown a tap substation for use on a high-tension line where no generating source occurs beyond the tap point. Oil breakers are used if generating sources are found on either side of the tap. The use of the air disconnect and fuse has been found very satisfactory and inexpensive for this type of substation, which is used to supply small communities having principally a lighting load. In Fig. 2 there is shown the layout of a substation



SWITCHES DESIGNED TO FACILITATE TAP CHANGING ON RELAYS

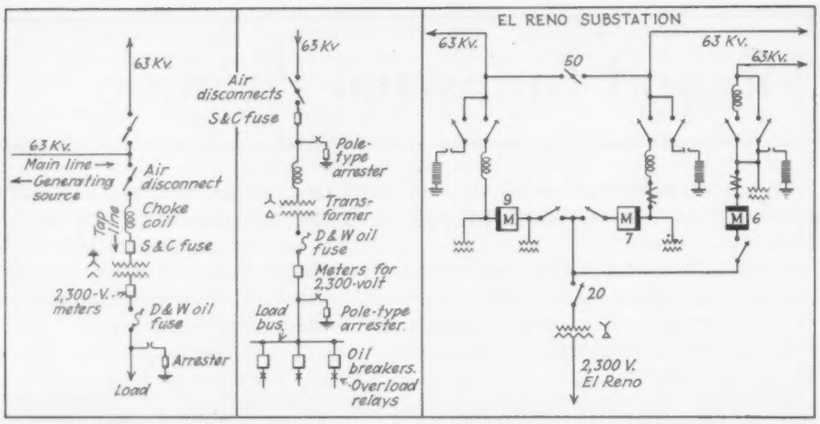


FIG. 1 (LEFT)—TAP SUBSTATION FOR A SMALL TOWN. FIG. 2 (CENTER)—TERMINAL SUBSTATION FOR A SMALL TOWN. FIG. 3 (RIGHT)—STANDARD TYPE OF TAP AND SECTIONALIZING SUBSTATION

used at the end of a high-tension line to supply a small town. Experience has shown that the low-tension oil breakers care for distribution troubles satisfactorily, and the tendency is to use automatic reclosing oil breakers on these stations. The air disconnect and fuse on the high-tension side of the transformers have proved very effective and inexpensive.

In Fig. 3 is shown a standard type of tap and sectionalizing substation developed for the system. Potential transformers are placed in the high-tension lines in order to synchronize, and one current transformer is used to operate the sectionalizing breakers. The bypass of the oil breakers is obtained by the use of an air disconnect in the event inspections or repairs are required. If wholesale power is sold at the tap, high-tension metering equipment is installed.

For each substation on the system a wiring diagram and a complete record of equipment is kept on file in the engineering department. Fig. 4 shows the form upon which record is kept of the equipment used.

Textile Hydro Plant Ties In with Utility

AN AUTOMATIC hydro-electric generating station soon to be installed by the Bibb Manufacturing Company, a textile plant at Porterdale, Ga., will be designed to operate in parallel with the Georgia Railway & Power Company system, will generate power for the Bibb plant and will improve poor power factor conditions at this point. The type of control used will be the first of its kind to be put in operation in this country.

The equipment will include two vertical waterwheel-driven generators rated 1,500 kva., 750 kw., 240 r.p.m., 2,300 volts; three 38,000/2,300-volt transformers, and a complete automatic switchboard.

The water power was formerly used to furnish mechanical power from horizontal wheels, and this old station will now be shut down. In tying in the automatic generating station with the public utility system the 2,300-volt bus will be connected to the 38,000-volt system through three single-phase transformers connected delta-delta.

With the object of supplying as much leading or corrective current to the system as possible a constant-current regulator will hold the full load of 1,500 kva. on the generators, in contrast to the usual practice of maintaining constant voltage. It is expected to improve the plant power factor by this method from 77 per cent to approximately 85 per cent.

Power for running the Bibb plant will come from the public utility lines in parallel with the automatic generating plant. The two hydro-electric generators will operate automatically in sequence and will be governed by a float switch located at the forebay. At the minimum water level one machine only will run, its entire output being made up of 1,500 kva. leading, thus having a maximum corrective effect on the system. As the water level rises, the actual energy load on the generator will increase and the supply of leading kilovolt-amperage will decrease until, at the maximum load point, the 1,500 kva. output will be made up of 750 kw. actual energy at 50 per cent power factor. The machines will run automatically under all normal conditions and will shut down automatically in case of trouble.

EQUIPMENT RECORD—SUB STATION Sheet No.

TRANSFORMERS

Line	Make	K.V.A.	Type		~	% Imp.	H. T. Volts	L. T. Volts	Pol.	Weight	Gal. Oil	Fuses	Size	El Spec	Serial	Co. No.	Position

OIL CIRCUIT BREAKERS

Line	Make	Type	Form	Poles	Volts	Amps	Weight	Gals. Oil	Operated	Opr. Circuit	Bushing No.	Serial	Sw. No.

AIR BRAKE & DISC SWITCHES

Line	No.	Make	Type	Volts	Amps	Poles	Break	Operated	Operating Oil	Serial	Sw. No.

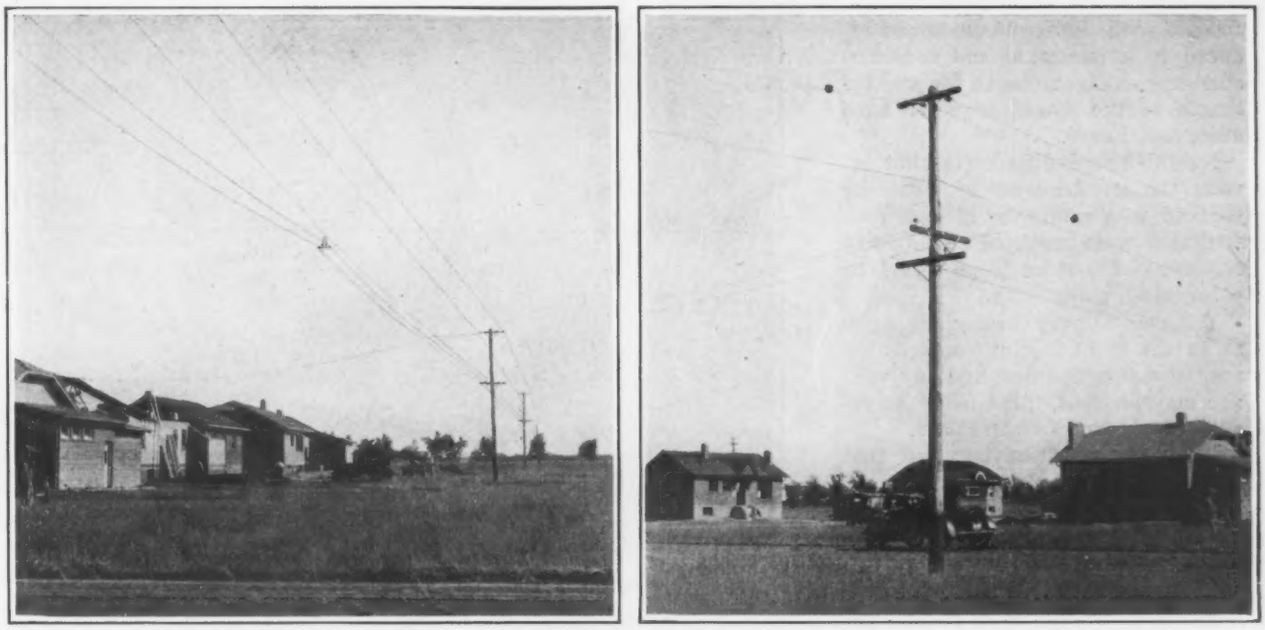
LIGHTNING ARRESTERS

Line	No.	Make	Type	Volts	Phase	Serial	

METERS, INST. TRANS. & RELAYS

Line	No.	Make	Type	Volts	Amps	Kind	Spec. No.	Serial No.	Bushings

FIG. 4—FORM ADOPTED BY THE OKLAHOMA GAS & ELECTRIC COMPANY TO RECORD EQUIPMENT USED



AT LEFT, CATENARY CONSTRUCTION FOR SECONDARY CIRCUITS THAT ELIMINATES EVERY OTHER POLE. AT RIGHT, CORNER CONSTRUCTION

Long-Span Construction for City Distribution Lines

BY H. H. KERR
Superintendent Electrical Department, Public Service Company of Colorado, Denver, Col.

IN CONNECTION with the study of long-span construction for rural districts, the Public Service Company of Colorado has recently developed a construction scheme that is suitable for city distribution. Steel-reinforced aluminum, hard-drawn copper or other suitable high unit strength conductors are used for the high-voltage circuits, whereas the low-voltage secondaries are supported at intermediate points in the span from a ⅜-in. steel messenger that serves as the neutral for the three-wire service and also as the support for service drops.

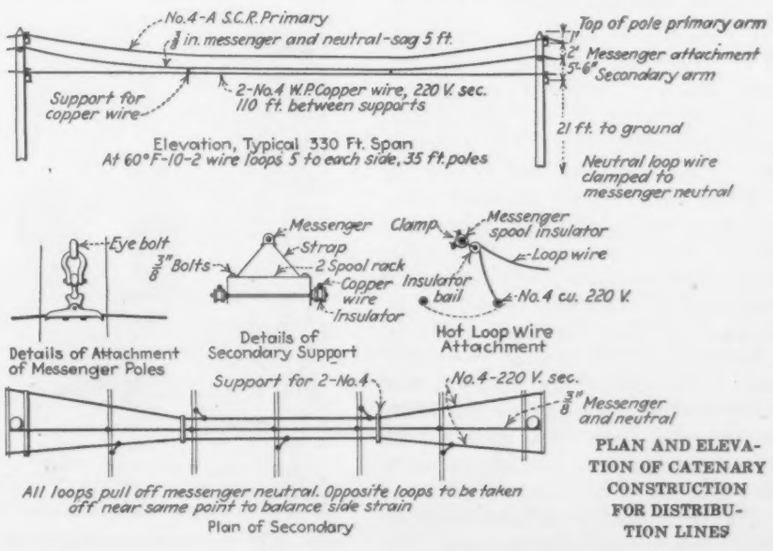
A plan and an elevation of a typical 330-ft. span, together with details of the scheme used to support the secondary wires and for the attachment of service loops, are shown herewith. The secondary wires are supported at two points in the span on a two-spool rack, which is attached to the messenger by means of a piece of strap iron bent to shape and bolted to the rack and messenger as detailed in the sketch. The secondary wires are placed on the end pins of a four-pin arm at the poles, the separation between them tending to prevent whipping of the conductors around the messenger. The plan shows the probable number of service loops that would be attached, one service loop having been allowed for each 50 ft. of property frontage. Opposite loops are attached at coincident points on the messenger to balance side strains as nearly as possible. The neutral wires of service drops are clamped directly to the messenger by means of Crosby clamps, whereas the hot wire is suspended from the messenger by means of a spool insulator and is tapped to one side of the 220-volt line underneath by means of a short jumper.

The messenger wire must be anchored to each pole to prevent uneven sags in it, since it is improbable that like numbers of loops would be attached in all spans. A suspension clamp and eyebolt hold the messenger from creeping and give flexibility, which should prevent crystallization.

Spans are 330 ft. each, only one intermediate pole having been located in blocks 660 ft. in length between street centers. This condition is the maximum that will obtain in Denver.

The smaller number of poles reduces the first cost of the installation, with a corresponding decrease in pole maintenance and capital charges. With 330-ft. spans in blocks of 600 ft. and 60-ft. streets, there can be only one pole in the way of garages, ashpits, back gates, etc.

In Denver the city requires a deposit of $5 for moving each pole in paved alleys, and 50 cents in alleys that are not paved. Considerable saving is realized if there is only one intermediate pole in each block. Since service loops may be taken off at any convenient point, tree inter-


No.4-A S.C.R. Primary
⅜ in. messenger and neutral-sag 5 ft.
Top of pole primary arm
11"
2" Messenger attachment
5'-6" Secondary arm
Support for copper wire
2-No.4 W.P. Copper wire, 220 V. sec. 110 ft. between supports
21 ft. to ground
Elevation, Typical 330 Ft. Span
At 60°F-10-2 wire loops 5 to each side, 35 ft. poles
Neutral loop wire clamped to messenger neutral
Eye bolt
⅜" Bolts
Messenger
Strap
2 Spool rack
Copper wire
Insulator
Clamp
Insulator bail
Messenger spool insulator
Loop wire
No.4 cu. 220 V.
Details of Attachment of Messenger Poles
Details of Secondary Support
Hot Loop Wire Attachment
Support for 2-No.4
No.4-220 V. sec.
⅜" Messenger and neutral
All loops pull off messenger neutral. Opposite loops to be taken off near same point to balance side strain
Plan of Secondary

PLAN AND ELEVATION OF CATENARY CONSTRUCTION FOR DISTRIBUTION LINES

ference with service loops can be reduced to a minimum and considerable copper saved due to the shorter length of the drops, together with decreased losses.

Neighborhood differences that involve the service company would be reduced to a minimum if such construction were used, since property crossings of service loops would be partly done away with.

The cost is very nearly the same as in the use of joint construction with signal companies, and any voltage may be used, there being no restrictions as in the latter case.

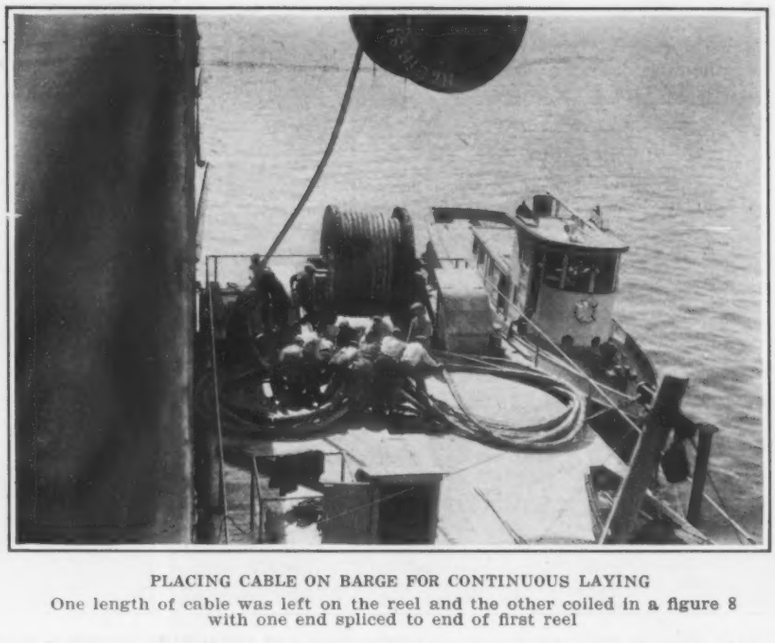
Among the disadvantages that may be enumerated is the fact that this type of construction can be applied, of course, only to pole lines that carry a few classes of service. Its use is restricted by local conditions, and in addition great care must be exercised in guying. The strain of the conductors, which are not supported by a messenger, is such that the crossarm must be guyed to a suitable stub and anchor at all dead ends. A suitable anchor capable of withstanding the maximum tension in the messenger is all that is necessary on lines where there is secondary service only. Where alleys are so located that guying facilities cannot be obtained—that is, "T" alleys, etc.—it will be necessary to install a short "slacked" span and self-supporting corner pole, the alley lead being properly anchored within the space of the "slacked" span.

Submarine Cable Laid in Record Time

BY J. M. GILLHAM
Superintendent Underground Department, Portland Electric Power Company, Portland, Ore.

WHAT is believed to be a record was established by the Portland Electric Power Company recently when an 11,000-volt, three-conductor, 400,000-circ.mil armored submarine cable was laid across the Willamette River at Portland Ore., a distance of approximately 1,800 ft., in seven minutes. The cable came from the manufacturer in two reels, one of which was placed on the barge intact and the other coiled in a figure 8. After having previously spliced the cables the figure 8 was laid out first, followed by the cable on the reel. In this manner the laying process was continuous when once started.

The cable was installed to provide better service to the business district of Portland and represents the major portion of a $300,000 budget item for underground extensions of the Portland Electric Power Company.



PLACING CABLE ON BARGE FOR CONTINUOUS LAYING
One length of cable was left on the reel and the other coiled in a figure 8 with one end spliced to end of first reel

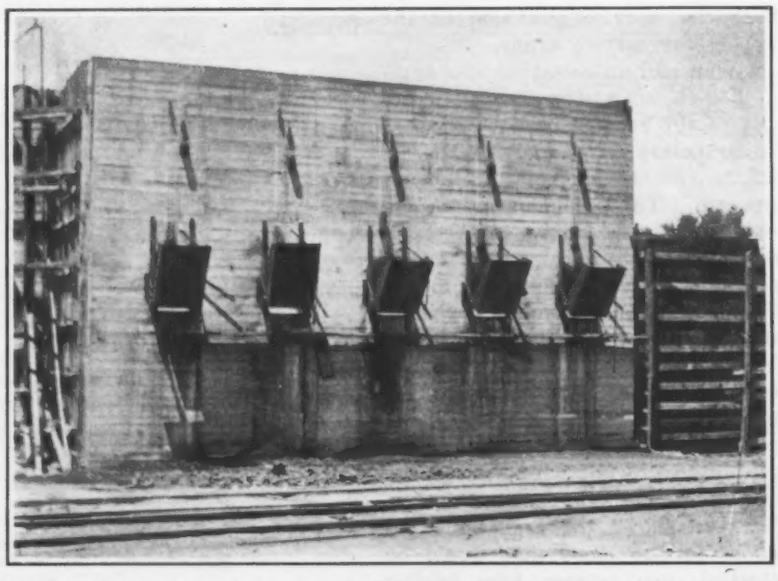
Power Plant Ashes Used by Public

BY G. A. SEAMAN
Southern Colorado Power Company, Canon City, Col.

ASHES from the plant of the Southern Colorado Power Company at Canon City, Col., until recently were dumped on company land adjacent to the plant. Necessity for a new method of disposal led to adoption of the following plan:

A concrete ash hopper approximately 12x36x25 ft. high was constructed at a distance of about 500 ft. from the plant. The ashpits at the plant and the hopper are connected with a 3½ per cent narrow-gage track, over which a Ford locomotive draws a side-dump ashcar. Five spouts on the front of the hopper permit emptying it into trucks or wagons. The city and county were offered the ashes free of charge for use on roads, etc. Free access to the ashes was also given to private individuals.

The system has been in use for several months with the result that the demand for ashes is much greater than the supply. The ease with which wagons and trucks can be loaded is a great inducement to users. Previous to this installation four men were required to handle the ashes, whereas now only two are necessary.



CONCRETE ASH HOPPER WHERE CITY, COUNTY OR GENERAL PUBLIC MAY LOAD ASHES

Commercial Activities and Public Relations

Utility Issues Booklet on Electrifying the Farm

WITH commendable forcefulness the idea that "electricity will do for agriculture what it has done for industry" has been brought out in the booklet entitled "How to Make More Money on the Farm," issued by the agricultural extension service of the Puget Sound Power & Light Company, Seattle. The booklet has an attractive front cover, which, besides carrying the title and sub-title quoted, has a picture in three colors symbolical of electrified agriculture. Within are twenty pages of terse, practical suggestions for the profitable utilization of electricity for light, heat and power in farming operations and in the farm home, together with drawings and specifications for the construction of newly developed equipment for the poultryman.

The basic idea of the book as announced on the cover is explained on the first inside page, in which it is brought out that "American industrial workers (through the application of electrically driven machinery to manufacturing) accomplish more, work shorter hours, receive more pay, save more money and enjoy more of the good things of life than the laboring people of any other country" and that "for agriculture to be as prosperous as industry in America, the farmer should benefit by industrial example and employ machinery and electric power to do the farm work wherever possible."

Following this are several pages of suggested uses in which the story is dramatized through the medium of pencil sketches contrasting old methods involving drudgery with modern methods employing electricity. Very little written matter is used in these pages, the story being put across by the cleverness of the artist in depicting, for instance, the misery of the man facing a pile of wood with a buck saw as against the apparent happiness of him who has belted a utility motor to a circular saw. Other applications are suggested under such headings as: portable farm motor; water, for irrigation and domestic use; better lighting, in the cow barn and chicken house; light, heat, power, in dairying; as well as the many uses in the home to bring comfort and leisure to the farmer's wife.

The agricultural extension service of the Puget Sound Power & Light Company is headed by J C. Scott, agricultural engineer, and is an activity of the commercial department under H. J. Gille, general sales manager. The service has given considerable impetus to the profitable extension of rural lines, principally in the western Washington territory of the company, where it is estimated that the company will build this year 600 miles of rural distribution lines to serve approximately 5,400 new farm customers.

New Salesrooms of Dayton Company

ONLY within the last year has the Dayton (Ohio) Power & Light Company been actively engaged in the sale of electrical appliances. For a number of years it was this company's practice to refer its customers' inquiries to the local electrical contractors, but experience proved that this arrangement was not entirely satisfactory and a merchandising department was created. K. Fitzpatrick, Jr., manager of the department, after about nine months' experience, states that this move resulted in creating an entirely different and improved atmosphere about the company's office. Customers who come to pay their bills are inclined to linger and inspect appliances. Sales have been so encouraging that it is hoped to put the department on a profit-making basis by next year.

PORTABLE LAMPS AN IMPORTANT PART OF DISPLAY IN NEW SALESROOM OF DAYTON POWER & LIGHT COMPANY

Training in Resuscitation

A PLAN of training in the Schaefer method of prone pressure resusciation, which will require employees periodically to demonstrate their proficiency in this work, is being worked out by the Washington Water Power Company of Spokane. Meetings of employees throughout the rural territory of the company are being held, to which the public and particularly students and teach-

ers are also invited, where the educational work is conducted by John B. Fisken, safety engineer of the company. Meetings in charge of the company physicians are now planned to demonstrate the approved first aid methods. About 60 "key" men of the company took an eight-hour course in safety practice, first aid and similar work late in April at which Martin J. Flyzik, supervisor of safety of the Washington State Department of Labor and Industries, presided.

Utility in Local Pageant

WHEN skillfully decorated, even so utilitarian a piece of equipment as an electric truck is capable of making a pleasing impression upon the critical eye seeking beauty in pageantry. The accompanying

ONE WAY OF KEEPING THE UTILITY FAVORABLY BEFORE THE PUBLIC

illustration shows a display made in a recent municipal celebration at Salem, Mass., to advertise the service of the Tenney syndicate, manager of the Salem Electric Lighting Company. Young woman employees of the Salem company in Colonial costume made no mean contribution to the good-will balance of this company as the truck made its way about town in the anniversary parade.

Power Sales Organization on Transmission System

THE Oklahoma Gas & Electric Company operates a large system that supplies 140 towns. It is in a rapidly growing territory and new towns are added frequently.

The power sales organization for the system is based on district operation and a headquarters staff at the general office. There are five districts on the system and each district has one power salesman to handle all wholesale power contracts. At headquarters there are two high-grade power salesmen and the manager of power sales.

Under normal conditions the district men care for all work, but the headquarters men are available to work on special situations or to aid a district salesman at times of peak load. The territory has a variety of loads such as cotton gins, oil-well pumping, pipe-line pumping, cotton-oil mills, lumber mills, flour mills and municipal pumping and lighting. The company operates in a territory that offers cheap oil as a talking point for the sale of oil engines. An average of two jobs a week of oil-engine competition occurs on the system and the effective work of the power sales staff is indicated by the fact that only eight oil-engine installations are found on the system, according to O. A. Jennings, manager of power sales. Gas is also abundant and cheap, and good sales efforts are necessary to sell electric service for oil-well pumping and for pipe-line pumping. More than 7,000 oil wells are pumped by electricity on this system and the oil pipe-line pumping load is of such a high load factor that it helps greatly in giving the system a 50 per cent load factor.

Under the conditions encountered it has been found best to use all-around power salesmen in the districts. They are able to handle any kind of business contract and can survey the possibilities of new towns for possible business addition.

Service of power loads of great variety on a large system is an important element in successful power sales. On this property the service department is under the jurisdiction of the system-operating department.

Electric Heat Saves Money in Hardening Process

BY E. L. KAVANAUGH
Sales Engineer Detroit Edison Company

IN A LETTER from the Hoover Steel Ball Company of Ann Arbor, Mich., to the Detroit Edison Company a very interesting comparison is made between the costs of electric and oil heating in the hardening of tapered roller-bearing cups.

In order to eliminate scaling of the product in the use of oil heat it was necessary to use a "clean-heat" process requiring special pots for containing the product. The pots were comparatively large and a loaded pot needed a considerable time lapse for the attainment of the proper hardening temperature. Because of the great number of pieces in a pot and the necessity for quenching each piece singly, those pieces that remained longest in the pot during the quenching operation received a "soaking" that changed their quality materially.

Quoting from the letter, "it was impossible to get a uniform facture from this process." Spoilage was high and lost time was about 60 per cent.

The electric furnace has eliminated both time and spoilage losses entirely and at a reduced cost. The energy consumption is about 221 kw.-hr. per ton of metal, which is approximately 9 lb. per kilowatt-hour.

Following is a table of operating costs of the two methods based on nine-hour production:

Cost of Oil Heating per Day		
Oil	$3.50	
Clean heat	20.00	
Pots	8.00	
Furnace maintenance	1.00	
Labor (eight men)	43.20	
Total		$75.70
Cost of Electric Heating per Day		
Energy	2.50	
Labor (three men)	16.20	
Total		18.70
Saving in operation per day		$57.00
Saving in operation per year (288 days)		$16,416.00

This table neglects interest, depreciation and other overhead charges that might operate to reduce the apparent saving. However, neither does it take into account the elimination of spoilage or the improvement in quality of product, which, taken singly or together, would much more than offset any reduction in saving due to the consideration of overhead costs.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Automatic and Supervisory Control of Hydro-Electric Generating Stations. FRANK V. SMITH.—The paper describes the application of automatic equipment and supervisory control to a number of interesting hydro-electric installations. A brief description is first given of the operation of standard equipment, the function performed by it and the protective measures provided. Several t pical stations involving single units, multiple units, self-synchronizing and automatic synchronizing are described, together with test results of the current surges occurring during the starting operations of several installations. Comments are ventured on the high-speed, synchronous-relay type of supervisory control and remote metering.—*Journal of A.I.E.E.*, October, 1926.

Boiler and Stoker Performance at Hell Gate Power Station.—H. W. LEITCH.—The object of this paper is to show the trend of development of stoker and boiler installations in a modern power house whose extensions have been made at fairly regular intervals and to give the effect of these yearly additions on the over-all efficiency and maintenance of the station. There is included a comparison of the essential features of the tests of the several types of installation, together with a detailed test of the latest performances. It is considered questionable by the author whether any considerable investment to improve the best-point efficiency of the station is warranted. As he expresses it, there remain, however, three important goals of endeavor. The first is to make the operating efficiency equal the test efficiency. This entails a perfect system of combustion control and a design requiring a minimum of maintenance. The second is to increase the range of high efficiency to allow of the accommodation to practical conditions of load variation and elimination of banking losses. The third is to reduce the investment by increasing the overload capacity of the evaporating surfaces and coal-burning equipment, by reducing the furnace volume and by more skillful design of the arrangement of apparatus.—*Mechanical Engineering*, October, 1926.

Generation, Control, Switching and Protection

Capacity Circuit Breaker.—F. HOFMANN.—The customary circuit breaker is a device which interrupts as suddenly as possible the flow of electrical energy. Its duty is to change the resistance at the rupturing point suddenly from zero to infinity. It is obvious that such a procedure causes grave disturbance of the condition of equilibrium, accompanied by overvoltages, arcs and occasionally explosions. Special precautions must therefore be employed to keep these undesirable phenomena within permissible limits. Very little thought has been given to the possibility of interrupting an electric circuit, not by cutting the flow, but by the more or less gradual introduction of capacity at the rupturing point. Instead of complex and costly oil switches, only disconnecting switches would have to be provided at switch points, and a few ambulant capacitors would have to be available in every station. If a given switch has to be opened, the capacitor is temporarily connected across the "disconnect," the latter is opened harmlessly, and the capacitor can be removed. Calculations indicate that such a capacitor would require about the same space as a standard breaker. Examples for 1,000-volt operating potential prove this statement. It is not so stated in the article, but it seems obvious that such an arrangement could only be used for very limited voltages.—*Siemens Zeitschrift*, August, 1926.

Transmission, Substations and Distribution

Some Notes on Electricity Transmission and Distribution Practice in Europe.—G. F. CHELLIS.—This paper describes some of the more recent overhead and underground electricity transmission systems and developments in Europe and is intended to convey a general idea of the status of that art in some of the European countries. No attempt, according to the author, has been made to include all the recent high-tension lines in the countries touched upon, but those included are typical of the work being done and the voltages in use. A most interesting part of the paper is a summary and analysis of the recent report of the Weir Commission of England recommending a policy with regard to superpower development in that country. The report covers a program extending to 1940 and proposes a plan of interconnection and base-load plant construction intended to tie together practically all parts of England.—*Journal of A.I.E.E.*, October, 1926.

Extra-High-Voltage Outdoor Substations.—Among the more recent examples of the use of extra-high-voltage outdoor substations in England are those on the North Metropolitan Electric Power Supply Company's main network. Five such substations are to be fed from the company's Brimsdown generating station, being connected partly by 33-kv. underground cables and partly by 33-kv. overhead transmission line. In a station of this description wherein the busbars are always "alive" it is important that painting and cleaning of the supporting structure be reduced to an absolute minimum; consequently the structure has been built of reinforced concrete, which is impervious to the atmosphere, in preference to galvanized steel. Although more expensive initially, this will prove economical in the long run, it is believed. Special attention has been paid to the lighting equipment on the outdoor gear to enable switching operations to be carried out at night.—*Electrical Review* (*England*), Oct. 1, 1926.

Units, Measurements and Instruments

Photo-Electric Photometer. — The principle of this instrument is that two beams of light from an electric filament lamp traverse two different, but similar, paths. By means of a shutter either ray is cut off so that at any moment only one ray can enter the photo-electric cell, in which it liberates a photo-electric current. This current is observed in the electrometer, forming part of the instrument. The one ray passes through the plate under test, the other ray passes through an optical wedge, and the wedge is raised or lowered until the deflection of the electrometer remains unchanged when the position of the shutter is changed over. The reading of the wedge then gives a measure of the density of the deposit on the plate. The advantages of the instrument, according to the author, are the slow changes in the sensitivity of the cell. The observer relies upon the repetition of an extreme deflection of his galvanometer. Gradual changes in the battery strength or in the sensitiveness of the cell do not affect that determination.—*Engineering* (*England*), Sept. 24, 1926.

New Permeameter.—R. V. PICOU.—To overcome certain disadvantages and inconveniences of the hitherto known permeameter, a French concern developed and brought on the market a new model which is described in this article. The test bundle of laminations, consisting of about 30 sheets, 8 in. by ¾ in., is placed within a coil, the magnetic path being closed by a packet of other laminations, passing a second coil. Three small exploring coils, installed within the main bobbin around the tested sheets, are connected to a ballistic galvanometer. A current-reversing switch and the necessary rheostats are built into the pedestal of the apparatus. Measuring results indicate an average accuracy of about 1 per cent.—*Revue Générale de l'Electricité*, Sept. 4, 1926.

Illumination

Proposed Basis of Rating for Measuring the Quality of Street-Lighting Service.—A. J. SWEET.—The problem of measuring the quality of street-lighting service is an extremely complex one, made up of various elements which must be independently measured and the results of such measurements combined with due regard to the relation of each element to the complete quality value. The principles governing the derivation of a net value from the values of elements and qualities is first studied. A division of the subject is then made as between utilitarian and esthetic qualities of street lighting. Illumination intensity measurement and brightness measurement, each taken as a significant point of measurement and each reduced to such value as would be equivalent for discernment were glare entirely absent, are then combined, the basis of combination varying with the value of the illumina-

tion intensity measurement. Service quality is separately measured for roadway and sidewalk, and the independent values are combined into a single value. With respect to esthetic qualities, the conclusion is reached that it is practical to derive certain principles of a general nature which will be of value in arriving at decisions as to relative esthetic merit, but that any quantitative evaluation of esthetic merit is impossible at this time. The relative weight which should be given to utilitarian considerations and to esthetic considerations in the design of a street lighting system is analyzed. — *Paper presented before Illuminating Engineering Society*, Sept. 10, 1926.

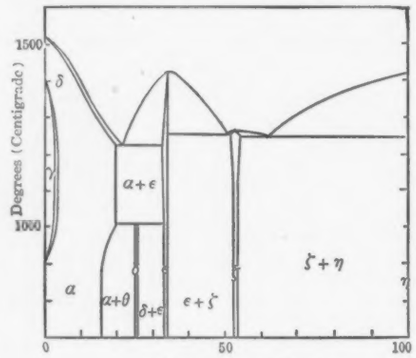
Motors and Control

Synchronous Motor Clocks. — H. VOIGT.—The basic idea of driving a clockwork by a small synchronous motor connected to an alternating-current supply, and thus to derive "time from a lamp socket," is about 20 years old, but it did not gain popularity until the tying of several generating stations into one system necessitated a close maintenance of constant frequency. A considerable amount of propaganda is now being spread in favor of these clocks, carefully omitting the fact of the many unavoidable temporary interruptions of current supply due to blown fuses. Each interruption stops, of course, the clocks connected to the circuit, and the synchronous motor is usually not self-starting. Stopped clocks or, with self-starting motors, wrong time indications are a serious drawback of these timepieces. In the author's opinion, a combination of such a clock and an automatically started mechanical clock in case of interruption should be developed. On the other hand, plain mechanical clockworks, set frequently by radio time signals, may give excellent service. But the general use of the present type of synchronous motor clock may miscredit electric timing service.—*Elektrotechnische Zeitschrift*, Aug. 26, 1926.

Individual Drive of Machines.—W. STIEHL.—In spite of the undeniable and generally conceded advantages of individual electric drive of machinery, the author regrets the very slow progress which is being made along this line in German factories, other countries being far ahead in that respect. To illustrate the possible improvements, the author selects in particular textile machinery and compares transmission drive with modern electric operation. Measurements made in large mills showed an over-all efficiency as low as 10 per cent for transmission drive. In a great many instances it was found that the factory owner thought to provide individual drive by installing a motor near the tool machine, formerly transmission-driven, connecting the motor with the machine by a belt. But this, the author states, is only a half-way solution. The modern trend lies in close co-operation between the mechanical and the electrical designer, resulting in tool machines with motors directly built in to form an organic unit. Many examples of such types are shown. This idea has been carried so far that spinning machines are being built today with a small motor for each individual spindle. A minimum of floor space, highest operating economy and utmost safety are salient features of factories equipped with such machines. In addition, a great improvement in lighting, both daylight and artificial, results from installations of this type. The seven-page article contains 35 illustrations.—*Zeitschrift des Vereines Deutscher Ingenieure*, Sept. 18, 1926.

Electrophysics, Electrochemistry and Batteries

Constitution of the Iron-Silicon Alloys.—G. PHRAGMEN.—One of the first constitutional diagrams that Tammann constructed, by the method of thermo-analysis, was that of the iron-silicon alloy. According to this diagram, only one intermediary phase is present. Tammann has pointed out that only this compound exists, and that the many "compounds" found by chemical analysis of residues did not enter into the consideration. There are, however, some observations published which, according to the author, are irreconcilable



IRON-SILICON EQUILIBRIUM DIAGRAM

with Tammann's diagram. The discrepancies between the results of previous investigators have been the motive for an X-ray investigation. The well-known troubles with technical 50 per cent ferro-silicon impart a special interest to the question of the existence of a compound $FeSi_2$. In addition to the X-ray investigation a series of micrographs were taken. In his investigation of the alloys the author has not found it necessary to repeat the thermal analysis.—*Engineering (England)*, Sept. 17, 1926.

Heat Applications and Material Handling

Thermal Insulation of Electric Furnaces. — M. L. HARTMAN and O. B. WESTMONT.—In this paper the thermal insulation of various types of electric furnaces is discussed. The thermal conductivities of fused alumina, fused magnesia, fireclay and a high-temperature insulating refractory are given in addition to the published data on silicon carbide, otherwise known as carborundum and silica. Mean specific heat curves for these refractories are also given. The temperature, heat losses and heat capacities of thirteen types of electric furnace linings are tabulated, with the inside surface temperatures assumed to be 1,600 deg., 1,400 deg. and 1,200 deg. C. The object of this paper, according to the authors, is to suggest possibilties of energy conservation in electric furnaces by properly designed composite walls.—*Paper presented before American Electrochemical Society*, Oct. 11, 1926.

Traction

Power Supply for Swiss Railway Electrification. — H. EGGENBERGER. — After eight years of electrical and cost investigation, the Swiss railway electrification committee decided in 1912 to change all federal railroads from steam traction to electric drive. Switzerland has at present 1,800 miles of federal roads, of which 1,000 miles will be electrified by the end of 1928, requiring annually 350,000,000 kw.-hr. at the power stations. The single-phase, 16⅔-cycle system with 15-kv. overhead-wire voltage was standardized for all roads. The very large and constantly growing supply of power for these railways is derived from eleven hydro-electric stations distributed over the country. The article gives short descriptions and recites the most important features of these power stations. Plans or photographs are shown of every station.—*Schweizerische Wasservirtschaft*, Aug. 25, 1926.

DATA ON SWISS FEDERAL RAILWAY POWER STATIONS

Name	Hydraulic Head Ft.	Output in Hp. Existing	Output in Hp. Ultimate
Amsteg	900	12,000	90,000
Ritom	2,600	8,000	60,000
Goschenen	260	1,400	1,800
Barberine	2,400	11,000	65,600
Vernayaz*	2,000	5,400	115,800
Eetzel	1,550	22,500	120,000
Ruppeswil	40	9,000	60,000
Waggital	1,400	140,000	210,000
Chancy	30	47,000	.....
Peuffeyre	1,300	18,000	.....
Ryburg*	36	118,000	.....

*Not completed.

Telegraphy, Telephony, Radio and Signals

Neutralization of Telegraph Crossfire.—R. B. SHANCK.—With the simple means described in this paper for neutralizing mutual interference between parallel telegraph circuits, it has been found practicable to effect a reduction to 10 or 20 per cent of the original values. This has improved considerably the operation of some circuits and made available others which were previously unsuitable. The resulting improvement in transmission has made possible the elimination of certain intermediate telegraph repeaters, with material savings. The neutralizing apparatus has no material effect when crossfire is not present; that is, when the paralleling wires are idle. It has been found that the use of arrangements here described on certain long open-wire circuits makes possible fast manual full-duplex operation where only medium-speed half-duplex operation was possible before. Furthermore, in the case of some cable circuits where it was impossible to operate more than two telegraph circuits per quad it is now practicable to obtain four telegraph circuits.—*Reprint B-205, Bell Telephone Laboratories.*

News of the Industry

Apparatus Division of N.E.M.A. Meets

New Organization of Former Power Club Perfected and Work Outlined at Briarcliff Manor—Industry Statistics and Business Policies Discussed

MORE than two hundred delegates journeyed to Briarcliff Manor, N. Y., this week to attend the first convention of the Apparatus Division of the National Electrical Manufacturers' Association, into which the Electric Power Club has been merged. This meeting was held from Oct. 25 to Oct. 28, and topics of much importance to electrical manufacturers came before it.

On Tuesday evening Gerard Swope, first president of the N.E.M.A., gave an address in which he outlined the new electrical organization. All branches of the electrical manufacturing industry are represented in it, and the organization will operate with a board and with three initial divisions, which will probably soon be increased to four. The Apparatus Division, the Supply Division and the Executive or Policy Division, already organized in part, will consist of unit groups of manufacturers with several sections in each division. The proposed fourth subsidiary body will be the Radio Division.

In the opinion of Mr. Swope, the new organization will bring unity and coordination among electrical manufacturers representing an annual gross business of $1,500,000,000 and will permit the manufacturing industry to act as a unit on matters of mutual interest or on national affairs affecting the electrical industry. President Swope read a letter from Secretary of Commerce Hoover in which Mr. Hoover said:

"I was glad to see the formation of the National Electrical Manufacturers' Association, as it appears that we shall now have an association covering the whole of the many different branches of manufacture of electrical apparatus. I believe such an association under proper guidance can perform a very useful service not only to the industry but to the public.

"Obviously this is an electrical age, and it is the duty as well as the privilege of manufacturers to foster and forward the wider use of electrical apparatus, for it brings greater comfort and convenience into the home and relieves sweat in the workshop. Of more importance, perhaps, than this is the fact that a truly national organization can undertake definite programs for the elimination of waste such as a collection of smaller associations could not effect. We have need of a great deal of standardizing of supplies and apparatus; we have need of simplification in many directions; we have need of more economic study and industrial statistics in the industry—all of which contributes to the more enlightened conduct of business and ultimately results in greater stability to industry and in favorable returns to the consumer and the public. A constructive trade association dealing with these fundamental questions is a necessity of our modern industry."

The rules of procedure, the complete formation of divisional organizations and other details of the new organization are now being prepared, and rapid progress was announced by Mr. Swope.

GERARD SWOPE, FIRST PRESIDENT N.E.M.A.

J. M. Curtin, vice-president of the N.E.M.A., who becomes chairman of the Apparatus Division, followed the address of Mr. Swope with an outline of the work of that division and made many constructive suggestions for the coming year. He urged all members to report freely the facts needed by the several sections so that the industry could operate more intelligently. The production of standards for manufacture and operation of apparatus has been well done by the division, he said, but there remain many opportunities in the development of principles of business conduct and in the compilation of industry statistics whereby business conditions could be improved. Mr. Curtin also suggested that a national electrical industry exhibition might be a worth-while development to follow the formation of the National Electrical Manufacturers' Association.

During the week the various sections of the division met together and discussed developments and practices. All these meetings were well attended and much constructive work was done. In the evening general meetings were held at which topics of general interest were discussed. At the meeting on Tuesday a committee reported on the progress of industry statistics and the formulation of data on business practices. Remarkable progress was recorded and the members voted that the committee continue its work. The presentation of the James H. McGraw award to Clarence L. Collens is recorded on page 942.

Golf, tennis and the banquet on Thursday night added elements of sport and pleasure for the entertainment of the members and the ladies who accompanied them. The unanimous opinion was that the first meeting under the new organization was entirely successful.

Central Maine Power May Build 100,000-Hp. Plant

In his annual report to the stockholders of the Central Maine Power Company President Walter S. Wyman predicts the immediate erection of a 100,000-hp. hydro-electric plant at Bingham on the Kennebec River should the Legislature repeal the law prohibiting the export of electrical energy from the state. "A change in the power export law," he says, "which would allow surplus power to be sent out of Maine into New Hampshire and Massachusetts would undoubtedly make it possible for us to proceed immediately with the construction of a 100,000-hp. plant at Bingham, and I hope to see this change come about and see this plant built within the next few years."

Mr. Wyman also refers to the three-unit, 27,000-hp. plant now under construction at Gulf Island above Lewiston, the first unit of which has just gone into operation, sixty days ahead of the time scheduled. The other two units, Mr. Wyman says in his report, will probably be completed and put in operation during the winter.

California Maintains Stand on Six-State Colorado Pact

When the special session of the California Legislature called by Governor Richardson to ratify unconditionally the six-state Colorado River compact met last week, both houses overwhelmingly declined to comply with the Governor's request. Instead a joint resolution was passed reaffirming the reservations passed by the 1925 Legislature. This resolution declared: "It is unnecessary and inadvisable to take action respecting the Colorado River compact as contemplated in the call for the special session," and that "the plan of handling interstate rights and relations respecting the waters of the Colorado River as expressed in the

Swing-Johnson bill is hereby approved and assurance is hereby given that upon the passage of said bill the state will take such action as may be necessary to render the bill operative and the compact unconditionally effective."

Governor Richardson in his message to the special legislative session pleaded for unconditional ratification of the six-state pact to clear the way for consideration of the Swing-Johnson bill at the short session of Congress in December.

Hydro Plant on the Batiscan River, Quebec, Starts Up

Another unit in the Shawinigan Water & Power Company's system in the Province of Quebec was brought into operation on Oct. 22, with the official opening of the St. Narcisse power development on the Batiscan River. Formal ceremonies and a luncheon marked the occasion.

The new development has an installed capacity of 22,000 hp., and the power generated is transmitted at 60,000 volts to Three Rivers, where it feeds into the Shawinigan system. The North Shore Power Company, a subsidiary of the Shawinigan Water & Power Company, developed power on this site as early as 1893 and transmitted it at 15,000 volts to Three Rivers, a distance of 17 miles. The North Shore company utilized the "Grande Chute" of the Batiscan for its old development, but three years ago it acquired also the rights to three other smaller falls a short distance down the stream. The present development utilizes all three falls and contains features which are unusual in power construction. It consists of a comparatively low dam above the Grande Chute, the power house in the gorge near the foot of the rapids and a tunnel 13 ft. in diameter through which the water is carried from the dam to the power house. The tunnel had to be driven through solid rock and from four different points.

St. Lawrence Permit Again Postponed

Absence of Quorum at Meeting of Water Power Commission Puts Action Over Till After Election—Financial Plans of Rival Applicants Sketched

ABSENCE of a quorum, whether or not brought about by political considerations, put over until a future date, at some time after election, definite action by the New York State Water Power Commission on the permits pending before it for development of St. Lawrence River water power. At the hearing on Monday, Oct. 25, the evidence was closed. After the various members of the commission have approved the minutes a date will be set at which final briefs will be received from the American Super-Power Corporation and the St. Lawrence Valley Power Corporation. At the hearing James W. Rickey, hydraulic engineer for the Aluminum Company of America, and Colonel Hugh L. Cooper offered further evidence in relation to the feasibility of the development from an engineering standpoint. Colonel Cooper stressed the importance of the ice problem which will have to be met in construction.

A financial picture of how the development would be financed was presented by both of the applicants. Both plans are, of course, tentative and dependent upon future conditions in the money market. George T. Bishop, president of the Frontier Corporation, which would finance the project if the permit is issued to the St. Lawrence Valley Power Corporation, said the initial expense would be borne by the stockholders of his corporation, possibly up to the point where definite progress in the development had been made, and that the ultimate financial plan would call for 50 to 60 per cent of the cost to be raised by mortgage bonds and 40 to 50 per cent divided equally between common and preferred stock.

Arthur B. Leach and Fay C. Hamilton, representing the Doherty interests and American Super-Power Corporation, said that in their judgment 75 per cent of the cost should be raised by mortgage bonds, 20 per cent by preferred and the balance by common stock. They would individually advance the moneys necessary for the engineering costs and market bonds when contracts were let for actual construction. Mr. Hamilton expressed confidence that if the utility market continues as it has for the past five years money can be obtained at from 4 to 4¾ per cent. Mr. Hamilton declared it was the purpose and intention of the American Super-Power Corporation to sell the securities in the enterprise to the people of the State of New York.

The absent members of the commission were Attorney-General Ottinger and Speaker McGinnies. The next meeting of the commission will, it is thought, be held early in November.

Attacks New York's River-Regulating District Act

An attack on the river-regulating district act of New York State has been made by E. W. Cady, Jr., secretary of the Adirondack Civic League, who bases his strictures on testimony given when the application of the Malone Light & Power Company for the creation of a reservoir on the Salmon River, in the Adirondacks, came before the State Water Control Board. This hearing was indefinitely postponed.

Mr. Cady claims that, under what he terms a "joker" in the law, the state would in this instance contribute 1,290 acres of land in the forest preserve, valued as land not to exceed $10 per acre, a total of $12,900, on which it would receive annually 6 per cent, or $774, or about 6½ cents per horsepower per year. The annual rental proposed for the St. Lawrence power under the Ottinger-Finch plan is $2.25 per horsepower per year, or about 35 times as much. Mr. Cady continues:

"One grasps the magnitude of the issue involved when it is realized that the state would receive $1,300,000 per annum if $2.25 per horsepower annual rental was paid for the 580,000 hp. increased primary power produced by the storage reservoirs on the Adirondack rivers, as against a little less than $18,500 a year if taken under the 'joker' in the act, a discrimination in favor of the private owners of the water rights of $1,281,500 per year.

"This rental" says Mr. Cady, "is probably not sufficient. On the basis of $5 per year per horsepower of primary power increase the return to the state for its assets used in the reservoirs on the Adirondack rivers would be $2,900,000 per year, much more than the annual return to the state for the St. Lawrence under the Ottinger-Finch plan."

Vote on New Commission Law in Colorado

On next Tuesday, Nov. 2, there will be a referendum vote in Colorado on a proposed law which will vest a newly created commission with complete jurisdiction over all public utilities except those municipally owned. Colorado is now one of the few states where the regulation of public utilities is not state-wide. In Colorado jurisdiction has been divided between a few "home rule" cities, with municipal regulation, and the Public Utilities Commission of the state, with jurisdiction in all other communities.

Boston Edison and Tenney Agree Upon Power Contract

Following an extended investigation of the economic possibilities of increasing the amount of energy purchased from the Edison Electric Illuminating Company of Boston, the Eastern Massachusetts Electric Company and the former recently appeared before the Massachusetts Department of Public Utilities seeking approval of a ten-year contract for this purpose. The Eastern company interconnects the principal central stations in the North Boston Lighting Properties group managed by Charles H. Tenney & Company of Boston, and these include the Malden Electric Company, Suburban Gas & Electric Company, Salem Electric Lighting Company and Beverly Gas & Electric Company. Most of the energy used in these systems is generated at the Salem steam plant, although an important interconnection has been in use for several years between the Tenney and Boston Edison company lines, and in 1925 the Edison company sold 5,297,000 kw-hr. to the Tenney group.

It is now proposed greatly to increase this taking, and the contract provides that the Edison company's obligation to install additional lines shall cease when the demand of the Eastern company reaches 100,000 kva. Under its terms the Eastern company guarantees the Edison company at least twice the cost of the lines required to render the

service, and an initial investment of $250,000 is contemplated, according to F. M. Ives of the Edison company. The Edison company's "N" rate, under which the Cambridge and Quincy companies are supplied, will apply to the contract. It is expected that this agreement will indefinitely postpone the building by the Tenney interests of another steam generating plant at Salem to supply the growing load of the north Boston system.

Cleveland Electrical Industry Well Demonstrated

Two thousand of the leading business men of Cleveland participated in the combined meeting and exhibition held, according to last week's announcement in these columns, on Tuesday, Oct. 26, for the purpose of demonstrating the electrical industries established in that city and designed as the first in a series of four such industrial celebrations sponsored by the Cleveland Chamber of Commerce in co-operation with the Electrical League and 29 other local civic and business organizations.

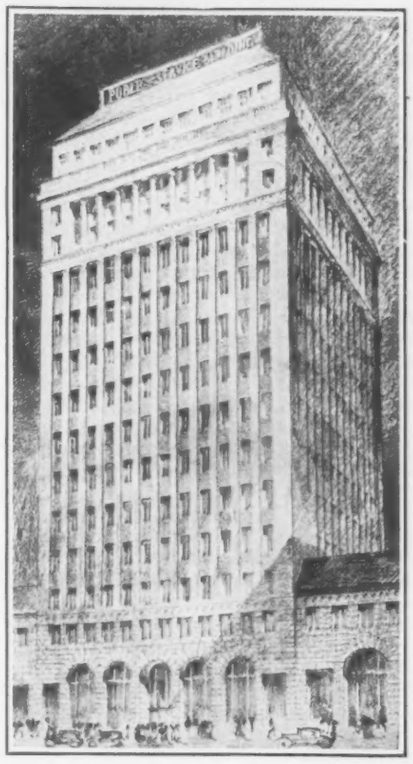
As a preliminary, the Electrical League of Cleveland set a special force of men to work making a census of the electrical industries, the first time anything of the kind had been attempted in that city. The census developed the fact that Cleveland has 135 manufacturers of electrical products, utilizing $75,000,000 of capital, outside of the hundreds of millions invested in the electrical public utilities, employing 16,000 people and turning out 250 different products ranging from minute 2-watt lamps to giant electric cranes and from tiny motors to electric street cars. The output of these manufacturers in the last year had a value of $130,000,000, exclusive of the value of public utility services.

Addresses of no little interest were made by J. F. Lincoln, vice-president and general manager of the Lincoln Electric Company, who is also vice-president of the Cleveland Chamber of Commerce, and M. H. Aylesworth, until very recently managing director of the National Electric Light Association.

Cheap electric power supplied by the electric utilities is the chief antidote for the industrial, commercial and domestic burdens of this country, Mr. Aylesworth, who is now president of the National Broadcasting Company, declared in his address at the luncheon meeting. "Electric power," Mr. Aylesworth continued, "is the most important offset against high cost of labor, high transportation charges, high prices of materials and high tax rates. It is one of the major assets of the American people." He went on to compare the per capita use of electrical energy in the United States with that in other countries.

President W. B. Stewart of the Chamber of Commerce opened the meeting, and Charles F. Brush, inventor of the Brush arc lamp, was among the prominent men presented to the audience. Most of the electrical products made in the city were on display on raised platforms, and following the meeting the exhibits were opened to the public.

New Public Service Building for Portland, Ore.



CONSTRUCTION of the "Public Service Building" in Portland, Ore., which is to house the offices and salesrooms of the Pacific Power & Light Company, the Northwestern Electric Company and the Portland Gas & Coke Company, is to start at once with the letting of the contract for more than $1,500,000. The building, which will be fifteen and one-half stories in height, will occupy the half block on the east side of Sixth Street between Taylor and Salmon Streets.

The three companies will occupy all but six floors of the building, including the ground floor and two basements. One basement will house a new substation for the Northwestern Electric Company. The ground floor will be divided between the Northwestern Electric Company and the Portland Gas & Coke Company principally for appliance display rooms and for customers. The third floor is to be given over to facilities for the employees of all three companies and will contain recreation and rest rooms, an assembly room, a library, a restaurant and an emergency hospital. Six floors will be available for rent.

The building, which will be the tallest in Portland, will be of concrete and steel construction with a green tile roof and will be faced with terra cotta and brick. It is to be of Italian Renaissance style, with marble floors and wainscoting. The lobby will be of marble with an ornamental ceiling. The first two floors, of which only part is shown in the reproduction of the architect's drawing printed here, will extend over the entire half block, and the remaining thirteen and one-half floors will occupy the central 100 ft. of the property, thus creating a tower-like effect. Should the future demand it, the side wings can be extended upward to the twelfth floor. The building was designed by A. E. Doyle.

Supply Jobbers to Broaden Membership

Movement by "Independents" Bears Fruit—Educational Course for Jobbers' Salesmen Now Ready—Addresses and Presentation of Certificates

AT THE winter convention of the Electrical Supply Jobbers' Association, held last week at the Hotel Traymore, Atlantic City, interest revolved largely around a movement on the part of the independent members of the association to bring about a larger representation from among the "free-lance" distributors of electrical supplies, so called to distinguish them from houses comprising the three groups affiliated with the General Electric Company, the Westinghouse Electric & Manufacturing Company and the Graybar Electric Company. Under the leadership of McKew Parr, president Parr Electric Company, New York, these "independent" members of the association held an informal meeting in advance of the convention session and appointed a committee to confer with the executive committee of the E.S.J.A. As a result of a general discussion of the desirability of a larger number of independent supply houses in the association and to encourage an expansion in this direction, the requirements for membership were reduced 50 per cent. Hereafter membership will be open to houses having a capital investment of $50,000 and annual sales of $250,000 and fulfilling the recognized functions of a jobber.

The completed textbook on "Constructive Salesmanship," which has been in process of development for the past year, was presented to the convention by the committee on dealer co-operation. This takes the form of a study course for jobbers' salesmen embracing the fundamentals of business practice for the contractor-dealer, including the figuring of cost and overhead, correct estimating, economic buying, store locations and management, choice and display of merchandise, turnover, sales and collections. These lessons will be provided by the association to its membership and conducted as a study course under the direction of the sales manager of each house, to school the jobbers' salesmen to understand better the business of the contractor-dealer and to be able to give him more intelligent guidance. O. F. Rost is responsible for the production of the course. W. R. Herstein is chairman of the committee.

Loyal A. Osborne, vice-president Westinghouse Electric & Manufacturing Company, addressed the convention on the subject of "The Real Value of

Trade Associations" and discussed the interrelations of the different branches of the industry as they function in the flow of goods and the need for a coordinated program in guiding distribution. B. W. Ruark, executive secretary of the Radio Manufacturers' Association, spoke on "Important Factors in Radio Merchandising" and outlined present trends in the wholesaling and retailing of radio. Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD, presented certificates of honorable mention given under the James H. McGraw award to W. S. Berry, W. I. Bickford, T. J. Creaghead and H. F. Thomas, as reported last week on page 884. Announcement was made that the next meeting of the association will be held in Montreal in May.

Jacksonville Municipal-Plant Bond Issue Carries

The election held at Jacksonville, Fla., on Tuesday, Oct. 26, to approve or disapprove the issue of $2,000,000 bonds for an extension of the municipal electric plant proved to be a victory for the bond advocates, the returns showing two votes for the issue to every vote against it. Frank Owen, chairman of the City Commission, declared that the municipal plant could now continue to keep pace with the growth of the city. "The present installed generating capacity of the plant is 27,500 kw.," he said. "Basing the growth for the next few years on that of 1925, the plant will be called on for a peak load of 36,000 kw. in 1930. With the new 25,000-kw. generator and three 1,500-hp. boilers that we shall be able to purchase with this bond money, the plant should carry us to 1934 without further additions."

Rapid Electrical Progress on Farms of Idaho

Use of electric power on the farms of Idaho is proportionately larger than in any other state except the three Pacific Coast states and two New England states, says the progress report of the Idaho Committee on the Relation of Electricity to Agriculture. This report, prepared in manuscript form originally, has recently been submitted to Governor C. C. Moore in its final condition. The report shows further a close correspondence between irrigation and the use of electricity on the farms. In other words, says the report, use of electricity is greatest on irrigated farms, not so great in the semi-dry areas, by which are meant the north Idaho wheat regions, and is sparse in the dry farm areas.

The total number of rural consumers receiving power in Idaho is reported by the 36 power companies of the state to be 7,006, served by 1,259 miles of rural distribution lines. "The irrigation pumping load," declares the report, "is a special factor in the rural use of electricity in Idaho. A large part of the total power utilized in the state is supplied to irrigation pumping. . . . The high-tension lines [to supply these units] running across the farms make it possible to install small substations to supply rural distribution lines."

Purchases and Mergers

Utilities Power & Light to Buy Insull Indianapolis Interests—Foshay Buys Montpelier & Barre

UNION of the competing light and power companies in Indianapolis—the Merchants' Heat & Light and the Indianapolis Light & Heat—referred to last week under a separate heading (page 869)—will, if the plans go through, be brought about through the acquisition by the Utilities Power & Light Corporation, Chicago, of the Merchants' company from the Insull interests and also of the minority stock holdings of the latter interests in the Indianapolis Light & Heat. The Utilities Power & Light owns operating companies in the Middle West and also in New Jersey. Early in this year the Insull interests acquired 28½ per cent of the common stock of the Indianapolis Light & Heat, paying, it is said, more than $6,000,000 for the stock, which was at a rate of $500 a share for stock with a par value of $100. Later the remaining common stock was acquired by the holding company, which is headed by Harley L. Clark of Chicago. It was erroneously stated in the ELECTRICAL WORLD last week that an attorney for the Merchants' Heat & Light Company had appeared before the Public Service Commission in the matter. The attorney who appeared represented the Indianapolis Light & Heat Company.

On Jan. 15, 1927, the W. B. Foshay Company will take over the Montpelier & Barre Light & Power Company and its subsidiary, the Green Mountain Power Company of Vermont, properties which serve a population of 50,000 with electric light and power. The properties of the Montpelier & Barre Light & Power Company will be taken into the People's Hydro-Electric Vermont Corporation, a subsidiary of the People's Light & Power Corporation, which will own all the common stock of the Green Mountain Power Company. The People's Hydro-Electric Vermont Corporation operates extensively in Vermont, owning the Burlington Traction Company in Burlington and electric properties in Vergennes and surrounding territory. In taking over the Green Mountain Power Company, which is just completing a new hydro-electric development at Molly's Falls (see ELECTRICAL WORLD for Oct. 23, page 876), the corporation will save, it is estimated, $75,000 per year in steam-plant operating expenses.

Approval has been given by the Wisconsin Railroad Commission to the negotiations by which the Wisconsin Gas & Electric Company is to take over the electric and gas municipal plants at Fort Atkinson for $450,000. The way is now clear to place the matter before the voters.

The Public Service Commission has granted the application of the Mohawk-Hudson Power Corporation (recorded in the ELECTRICAL WORLD for Oct. 2, page 719) to acquire and hold all or more than 10 per cent of the outstanding common capital stock of the Troy Gas Company, which has an electric division. The Mohawk-Hudson company now controls most of the electric and gas companies operating in territory adjacent to Troy. The Troy company now purchases its electricity from the Adirondack Power & Light Corporation, owned by the Mohawk-Hudson company.

The Nevada-California Electric Corporation has purchased the Yuma Utilities Company, serving Arizona territory south of Yuma. The price was not given. The Yuma has been purchasing its power from the Nevada-California, distributing it over its own transmission lines.

Haddam, Kan., to which the Kansas Power Company, Concordia, has wholesaled energy since 1921, has sold to that company its distribution system and transmission line.

New England Power Purchases Storage Facilities

Stockholders of the New England Power Association have ratified an agreement for the purchase of the Connecticut Valley Lumber Company and the resale of its timber lands to a new corporation to be controlled jointly by the International and St. Regis Paper companies. The Power Association will retain control of water rights on the upper Connecticut River, permitting the developmeint of 80,000 kw. By this deal the Power organization will acquire control over lumber ponds which can be utilized as storage reservoirs to eliminate floods in the river as far south as Turners Falls, Mass., also increasing the annual kilowatt-hour output of the developments at Vernon and Bellows Falls. The lumber company owns 320,000 acres of timber land in northern New Hampshire and Vermont in addition to its undeveloped water powers. The Power Association will pay $1,000,000 in cash, of which $300,000 will be retained for condemnation of lands necessary to power development not now owned by the lumber company, and 95,238 shares of Power Association common stock. The latter will be delivered in five annual installments, including 1931, or earlier if the so-called Fifteen-Mile Falls development is completed before the latter date.

Speed Record in Rehabilitation by Westinghouse

In the midst of reconstruction on the Florida Causeway after the hurricane, the motors operating the bascule bridge at Miami, over which the boulevard passes, gave out and supplies necessary to Miami and other towns were held up by the accident. New coils were necessary. Miami sent an urgent call to the Atlanta offices of the Westinghouse Electric & Manufacturing Company, forwarding sample coils by air mail. Upon receipt of the order and the coils, the service department of the Westinghouse company was immediately organized to work in 24-hour shifts. The first set of new coils was sent by express to the striken territory on the next day, and another set the day after that. Personal tracers accompanied both consignments to keep the routes open, and traffic on the Causeway was restored in less than a week.

New Muscle Shoals Bid

Farmers' Federated Fertilizer Corporation to Offer $25.50 Rent per Kilowatt-Year

AS BRIEFLY reported in these columns two weeks ago, a new proposal for the lease of the government's properties at Muscle Shoals is to be presented to Congress when it reconvenes in December. C. Bascom Slemp, former secretary to President Coolidge, is the attorney for the new company, which, as previously stated, will bear the name of the Farmers' Federated Fertilizer Corporation.

The bill prepared for presentation to Congress in the interest of the new company provides that it shall issue 300,000 shares of preferred stock at $100 a share and 300,000 shares of common stock without nominal value. The corporation, says the bill, shall pay an annual rental for all of the leased property to be taken from the receipts from the sale of power, commencing with the calendar year following the placing in operation of Dam No. 2 with eight generating units, at the rate of $22.29 per kilowatt-year (8,760 kw.-hr.) for all primary power generated and sold by it from the power plants included, this rental to be raised to $25.50 when certain items of uncompleted work shall be finished. The corporation will pay rental at the same rate for all additional generating facilities (including 120,000 kw. which it proposes to install at Nitrate Plant No. 2), whether the completion of such facilities is financed by the government or the corporation. Under failure of the government to exercise its right of further power development within one year after notice by the corporation that such development is desirable, the corporation may undertake it, deducting from the gross rentals a yearly amount for amortization and interest charges.

Power needed for fertilizer manufacture is to be furnished by the corporation on as favorable a basis as power supplied to any other customer, but the corporation shall make no profit nor incur any loss through such manufacture. The corporation's rates shall be regulated by any state commission or other governmental body having jurisdiction, and under specified conditions it will build transmission lines and substations. A board of industrial development, a board of research and a farmers' board shall be set up as controlling agencies, the first to contain three representatives of the government and four of the corporation, the second and third to be appointed by the Secretary of Agriculture from bodies which are specified, and research, emergency, fertilizer and renewal and replacement funds shall be set up.

The following items of uncompleted work are to be carried to completion: (a) Changes and additions in the nitrate plants for use in the manufacture of fertilizer; (b) completion of Dam No. 2 with full equipment of eighteen generating units; (c) construction of Dam No. 3 with full power equipment and tie line to Dam No. 2; (d) additions to Nitrate Plant No. 2 to bring its capacity up to at least 120,000 kw.

The duration of the lease is to be fifty years, the corporation to have the right of primary consideration at the end of that period should the government determine to continue to rent the plants, and the government to have the right of recapture in the event of war.

Congressman Quin Still Favors Muscle Shoals Bill

Reports that Representative Quin of Mississippi has decided to withdraw his support from the Muscle Shoals bill of the joint congressional committee are without foundation. Mr. Quin has returned to Washington after four months in his district and is more certain than ever that the bill of the joint committee is in line with the desires of the people of his state. Mr. Quin is the ranking minority member of the House military affairs committee, which had the matter in charge, and therefore his attitude is important.

Novel Course at Princeton

Appeal for Laboratory Based on Its Educational Plan—Engineering and Cultural Study Combined

FUNDS are being sought by Princeton University for an engineering laboratory to house its School of Engineering, established in 1921, for which the existing provision is inadequate. Princeton is not endeavoring to set up another standard engineering school to compete with the well-established institutions now in existence. The university bases its appeal on the novel, if not unique, character of its engineering courses, which embody cultural along with fundamental technical studies in each year of a four-year course, reserving detailed engineering subjects for an optional fifth year. The cultural subjects have been cared for by requirements in English, modern languages and economics in the first two years and by a certain amount of elective freedom in non-engineering subjects in the two later years. Four-year courses are offered in civil, electrical, mechanical, chemical and mining engineering. By each of these courses graduates are prepared to take subordinate positions where fundamentals, but not detailed engineering preparation, are required. At the end of four years the degree of B.S. in engineering is given, while at the end of the fifth year the degree of civil engineer, electrical engineer, mechanical engineer and chemical engineer is given, a fifth year in mining engineering not being included.

The undergraduate course is adapted to those students who plan to enter upon business careers in which engineering knowledge and training are required, but who are not to become professional engineers themselves. It is the expectation of the engineering faculty that at least half of the graduates will return to Princeton for the fifth year. Others may desire to take a fifth year at another engineering school, and the four-year schedule at Princeton fits its graduates to enter the senior class of such institutions.

Power Commission News

Permits Authorized for Skagit and Okefenokee Projects—License for Big Pigeon River

THE Federal Power Commission has authorized a preliminary permit for the city of Seattle covering its proposed further development on the Skagit River in Whatcom County, Wash. The project is intended to utilize effectively the entire head of the Skagit River between the Canadian boundary and the city's constructed Gorge power house. The estimated capacity of the entire project is 260,000 hp., which is to be developed in three stages as the needs of the city require. The permit is to contain a provision that water must be stored in such a way as to prevent floods below the dam.

The commission also authorized the issuance of a preliminary permit to Ernest L. Hill and C. Lyman Spencer of Jacksonville, Fla., covering five sites on the Suwanee and St. Mary's Rivers. As already reported in these columns, it is planned to create a large storage reservoir in the Okefenokee Swamp, in south Georgia, in which both rivers have their source. About 40 miles of levees will have to be built. The plan calls for dams at Trail Ridge and Traders Hill on the St. Mary's and another near its mouth. Two dams are to be constructed on the Suwanee River, one near White Springs and the other near Branford. Power houses are to be built at each dam. No one of these projects taken separately is feasible, the commission's staff reports, but as a combined project there is a reasonable prospect of the whole system proving financially successful. The permit will contain conditions in the interest of navigation.

A license has been authorized for the Carolina Power & Light Company of Raleigh, N. C., covering the project previously noted on Big Pigeon River in Haywood County. The preliminary permit covering this project was issued March 4, 1924, to the Pigeon River Power Company, which turned it over to the licensee. It is proposed to construct a concrete arch dam 130 ft. high, to be raised later to a height of 180 ft. A conduit 6 miles long will carry water to the power house, where 35,000 hp. is to be installed initially and 70,000 hp. ultimately. The primary capacity of the project is 23,760 hp.

Licenses were authorized to cover the construction of an additional reservoir by the Sierra & San Francisco Power Company in connection with its project on the Stanislaus River, and for a small project on Bilk Creek in San Miguel County, Col., the applicant being W. R. Vanderveer, of Ophir, Col.

The Royal Development Company of Butte, Mont., has surrendered its license covering a small project in Chelan County, Wash.

A preliminary permit was authorized for A. A. Shuford and F. M. Laxton of Charlotte, N. C. The permit covers a project on Wilson Creek, in Caldwell County, N. C., where it is proposed to construct a dam 250 ft. high with a conduit leading to the power house one

mile down stream. The primary power available is 3,070 hp.

The preliminary permit of A. T. Seybold for a project on Klamath River has been extended until Aug. 7, 1927. The permit of the Electro Metals Company of San Francisco for a project on the same river has been extended until Aug. 7. An extension until Oct. 25, 1927, has been allowed the city of Sacramento for its proposed development on Silver Creek in the South Fork of the American River. A similar extension has been granted the El Dorado Company on its Placerville project.

The Federal Power Commission has rejected the application of the Tongass Power & Light Company for a preliminary permit covering a power project on the Salmon and Soule Rivers in Alaska.

The South Branch Power Company, Philadelphia, has applied for a preliminary permit for three dams on the Cacapon River and four dams on the South Branch of the Potomac River, in Morgan, Hampshire, Grant and Hardy Counties, West Virginia. The power is desired for public utility purposes.

E. G. Salt of San Francisco has applied for a license covering a small diversion from Deer Creek for his Glen Alpine plant.

In a report to the commission the Chief of Engineers approves of the plan of power development at Dams Nos. 9, 12 and 15 on the Cumberland River.

The commission holds that the proposed development of the Guadalupe Power Company of Seguin, Tex., in the Guadalupe River, near New Braunfels. comes within the purview of the water-power act. A project of the Silver Hill Power Company on Fish River, 4 miles above Silver Hill landing, was found not to come within the purview of this act.

Year's Hydro Licenses Total 1,220,000 Hp. Ultimate

Of the 3,866,000 hp. which has been placed under license since the enactment of the federal water-power act in 1920, nearly 35 per cent was put under construction during the last fiscal year. The projects licensed in that period and their ultimate installations are as follows: Susquehanna Power Company and Philadelphia Electric Power Company, Susquehanna River, 473,000 hp.; Alabama Power Company, Lock 18, Coosa River, 180,000 hp.; Nevada Irrigation District, Yuba River, 150,000 hp.; Louisville Hydro-Electric Company, Ohio River, 135,000 hp.; Mount Shasta Power Company, Pit River plant No. 4, 100,000 hp.; San Joaquin Light & Power Company, Kings River, 65,000 hp.; Feather River Power Company, Feather River, 60,000 hp.; Pacific Gas & Electric Company, Mokelumne River, 42,000 hp.; various small projects, 15,000 hp. This makes a total of 1,220,000 hp. The record of the fiscal year also is notable for the fact that the installed capacity of the projects east of the Mississippi River is nearly double that of the projects west of the river which have been licensed.

Briefer News

Healdsburg, Cal., Refuses to Give Up Its Electric Plant.—The City Board of Healdsburg, Cal., has announced its opposition to relinquishing the municipal light and power plant under any conditions. The announcement was called forth by a report that a large central-station company was desirous to negotiate a lease of the electric plant in return for which it would undertake to supply the city with gas.

Decision on Laclede Gas Company Valuation Expected Soon.—The Missouri Public Service Commission will soon hand down its decision in the Laclede Gas Light Company valuation case. It is anticipated that it will decide that for rate-making purposes the company's holdings have a valuation of approximately $55,000,000. The company, which does an electric as well as a gas business, has contended for a valuation exceeding $74,000,000, while experts testifying for the city of St. Louis pared this down to $40,000,000.

Ten-Day Public Celebration for Kearny Station.—No less than ten days is to be devoted to the celebration of the completion, as already noted in these columns, of the first half of the Kearny (N. J.) electric power station of the Public Service Electric & Gas Company. Tuesday, Nov. 9, has been set aside for public officers, engineers and leading representatives of the electric industry in the state and throughout the country; Nov. 10 and 12 for Public Service security holders; Nov. 15 for industrial power users, manufacturers and others particularly interested in power matters; Nov. 16 and 17 especially for women; Nov. 18 and 19 for the general public, while on Sautrday, Nov. 13, and Saturday, Nov. 20, employees of all Public Service companies will be received.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations, with their secretaries, is published in the first issue of each volume. For latest list see Electrical World, July 3, page 50.]

National Association of Railroad and Utilities Commissioners—Asheville, N. C., Nov. 9-12. J. B. Walker, 270 Madison Ave., New York.

American Engineering Council—Administrative board, Ithaca, N. Y., Nov. 11 and 12. L. W. Wallace, 26 Jackson Place, Washington, D. C.

American Institute of Electrical Engineers — Regional meeting, New York, Nov. 11-12. F. L. Hutchinson, 33 West 39th Street, New York.

National Electrical Credit Association—Philadelphia, Nov. 12; New York, Dec. 7; Boston, Jan. 18. F. P. Vose, 1008 Marquette Bldg., Chicago.

Empire State Gas and Electric Association — Electric Meter Section, Hotel Seneca, Rochester, Nov. 15 and 16. C. H. B. Chapin, Grand Central Terminal, New York.

American Welding Society — Buffalo, Nov. 16-19. M. M. Kelly, 29 West 39th Street, New York.

American Society of Agricultural Engineers, Farm Power and Machinery Division—Chicago, Dec. 1 and 2. Raymond Olney, St. Joseph, Mich.

American Society of Mechanical Engineers—New York, Dec. 6-9. C. W. Rice, 29 West 39th St., New York.

Northwest Association of Electrical Inspectors—Multnomah Hotel, Portland, Ore., Jan 18 and 19. F. D. Weber, Box 745, Portland.

A College Course in Tree Trimming.—The damage sometimes done to trees by the stringing of electric wires has been so much discussed that the New York State College of Forestry at Syracuse University is offering to linemen a course of instruction in tree trimming. The course was started through the efforts of the Empire Gas and Electric Association. It will consist of lectures and discussions, supplemented by field trips for the study of actual conditions and demonstrations in tree pruning. In addition, the course, which will extend from Nov. 15 to Nov. 20, will include a study of tree culture.

Rochester Company to Install New Hydro-Electric Unit. — The Rochester (N. Y.) Gas & Electric Corporation is planning to spend $1,100,000 for additional water-power development at its Station No. 5, at the Lower Falls of the Genesee River. The project involves a 20,000-hp. turbine and a 75-ft. extension of the present building, erected in 1914. The new unit will be the largest in the company's system and will increase its electrical output by 22,000,000 kw.-hr. a year. Work will start immediately, and it is expected that the new unit will be ready for service by the fall of next year.

Reading Railway Contemplates Electrification.—That the Reading Company, which has an extensive railroad system in Pennsylvania and New Jersey, is maturing electrification plans was indicated last week when Charles E. Ewing, vice-president, stated that a comprehensive survey of its suburban lines is being made by engineers from the Westinghouse and General Electric companies, together with the railway's own engineers. A report is expected in three months, Mr. Ewing said, adding: "The task is gigantic, involving millions in expenditures and serious engineering problems. The matter of grade crossings is one of the most serious."

Negotiations for Municipal Plants in Virginia Continue.—Agreement is reported between representatives of the city of Danville, Va., and officials of the Appalachian Power Company relative to terms under which the corporation would operate the city's electric and gas plants if a sale were to be made. The committee is now prepared to report the full terms to the City Council, which is expected to vote favorably on the sale and refer it to public vote. It is apparent that if the Appalachian company does not go to Danville, it will skirt the city line, offer power to suburban settlements and head off in the direction of Roxboro, N. C., where contact is to be made with the Carolina Power & Light Company. The Appalachian Power Company has also

offered the town of Martinsville, Va., $250,000 for its hydro-electric plant on Smith River and its distribution system. A committee of the Town Council has been appointed to make a report on the offer, and, if it is approved, a public referendum will be held.

Chippewa Falls Distribution System Valued. — When the citizens of Chippewa Falls voted in May, 1925, in favor of taking over the electric distribution system of the Northern States Power Company controversy over the purchase price was referred to the Wisconsin Railroad Commission. Under a decision handed down on Oct. 20 the commission has fixed the price at $167,000, exclusive of all materials and supplies on hand. The decision further provides that the city shall purchase power from the company, at a rate to be fixed by the commission, for a period of not less than two years after acquiring the system and shall give one year's notice if it wishes to discontinue buying its power. The company valued the system at approximately $200,000.

Los Angeles Bureau of Power and Light to Spend $11,000,000.—In accordance with the decision of the voters as expressed emphatically at the poles on Aug. 31, Los Angeles is to issue $21,000,000 in bonds for the use of the water and power departments. The Bureau of Power and Light will receive $11,000,000 of this sum, which is to be spent for the development of 28,000 hp. of additional hydro-electric energy along the Owens River Aqueduct, for the acquisition of rights-of-way and construction of tower lines and two additional electric stations as a part of a high-voltage transmission system which ultimately will include the city, and for the purchase of privately owned electric distribution lines in recently annexed districts.

Expansion of United Light & Railways Company.—A 25-mile transmission line between Omaha, Neb., and Missouri Valley, Iowa, has just been erected by the United Light & Railways Company as a step in an interconnected loop system of the Nebraska Gas & Electric Company and the Iowa Service Company. This loop, with Omaha as its center, will serve a territory reaching from Norfolk, Neb., and Dunlap, Iowa, on the northeast, to Red Oak and Malvern, Iowa, on the southeast. Another undertaking to be executed by the company in the near future is a 66,000-volt substation at Plattsmouth, Neb., which will be connected with lines from Lincoln and Omaha and from Malvern, Iowa.

One Unit of Gulf State Station at Neches, Tex., Finished.—At a cost of approximately $4,000,000 a 25,000-kva. turbo-generator, the first of five units that are to compose the power station of the Gulf States Utilities Company on the Neches River on the outskirts of Beaumont, Tex., has just been finished. Construction of the second unit will be started soon, it is believed. The total cost of the power enterprise of the company will, it is estimated, reach $17,000,000. The Gulf States Utilities Company, which has its headquarters at Orange, Tex., is one of the Texas operating companies owned by the Stone & Webster Engineering Corporation of Boston. The new station is to have an ultimate capacity of 300,000 kw. The boilers are equipped to burn either natural gas from the fields north of Beaumont or fuel oil from the company's supply tanks, which at present will be used only in case of emergency, and, if more economical, pulverized coal may be burned by installing the proper equipment.

A 2,000-Watt "Eveready."—The "biggest flashlamp in the world" is a feature of the exhibit at the Sesquicentennial Exposition of the National Carbon Company, Inc., makers of "Eveready" flashlamps and radio batteries. This flashlamp, measuring 6½ ft. in length and 2½ ft. in diameter, is an exact working reproduction, on a gigantic scale, of one of the popular models manufactured by the company. It is energized from the electric lighting system of the exposition and has a 2,000-watt lamp.

Notable Automatic Hydro-Electric Station. — A single-unit automatic hydro-electric generating station of unusual size is being erected on the Elwha River, 11 miles from Port Angeles, Wash., by the Northwestern Power & Light Company. This station, to be known as the Glines Canyon power house, will furnish power for the operation of the Washington Pulp & Paper Company's plant at Port Angeles. It will probably go into operation early in 1927. A single-arch dam is being constructed, approximately 190 ft. high, forming a reservoir which will impound about 40,000 acre-ft., the drawdown from about half of which will be used in generating electricity. The power house will be approximately 800 ft. downstream from the dam and on the western bank of the river at the mouth of a gorge. The water will be conducted from the dam to the power house through a tunnel 575 ft. in length. The generating equipment will consist of a 17,500-hp., vertical-shaft Francis turbine furnished by the Pelton Water Wheel Company, driving a 13,333-kva., alternating-current, 6,600-volt, three-phase, 60-cycle, 225-r.p.m., 90 per-cent-power-factor, vertical generator with directly connected exciter. This generator and all the other electrical equipment will be of General Electric manufacture, including three 4,500-kva. outdoor-type transformers and necessary switching equipment. The automatic equipment will control and protect both the main unit and a 62.5-kva. auxiliary waterwheel and motor-driven oil-pump unit. By means of selector supervisory equipment the operator at the Elwha station, 7 miles distant, will give starting and stopping indications and supervise the running of the automatic plant.

Worcester Merger Plans Heard at Boston.—An all-day hearing upon the proposed merger of the Worcester Electric Light Company and the Worcester Gas Light Company took place last week before the Massachusetts Department of Public Utilities, and at its close the commission took the matter under advisement. Violent newspaper attacks upon the former company during the past few weeks have been followed by petitions for rate reductions in both electric and gas fields. It was brought out at the hearing that, although the electric light company is one of the most prosperous in the state, its rates are among the lowest charged by Massachusetts light and power companies. Chairman Henry C. Attwill of the commission commended the company's treatment of the public.

High Transmission Towers Under Way.—In order to comply with the government's requirements for clearance of navigable steamers, it will be necessary for the Pacific Gas & Electric Company to build five towers ranging in height from 269 ft. to 459 ft. to carry its new 220,000-volt transmission lines across the Sacramento and San Joaquin Rivers. Two of these towers will be required to cross the Sacramento and three to cross the San Joaquin. The tallest tower in the latter span will be 359 ft. Six copper-clad steel cables without a splice will stretch from anchorage to anchorage across these rivers, the span across the Sacramento being 7,029 ft. and that across the San Joaquin 8,835 ft. In order to maintain the height of the wire above the river, intermediate supporting towers are being built, so that the longest unbroken span across the Sacramento will be 4,125 ft. and that across the San Joaquin 3,175 ft. Unusually high towers for transmission lines in New England will be those which are now being constructed by the Edison Electric Illuminating Company of Boston for the Weymouth Fore River crossing from the new Edgar station on the transmission line which is being erected southward to the town of Bellingham. These towers will be 277.8 ft. above their foundations, or about 295 ft. above mean low water. The total length of the crossing above the river will be 4,000 ft. in two spans of 2,000 ft. each, and the wires at their lowest point will be 150 ft. above high water.

Men of the Industry

Hellmund and Dudley of Westinghouse Organization Promoted

R. E. Hellmund, formerly engineering supervisor of development of the Westinghouse Electric & Manufacturing Company, has been appointed to the newly created office of chief electrical engineer, and A. M. Dudley, formerly manager automotive equipment engineering department, has been appointed engineering supervisor of development, the position left vacant by Mr. Hellmund's promotion. Mr. Hellmund's activities in his new position will be principally in connection with electrical development work to assure the adequacy and progressiveness of designs and to co-ordinate this work properly throughout the different engineering departments. In the capacity of engineering supervisor of development Mr. Dudley will be responsible for all central activities of the engineering department in connection with the development budget and program of the electrical group.

Mr. Hellmund is known in the electrical and allied industries for his inventive genius and his work on the design of new and improved electrical apparatus, holding almost 300 patents taken out in the United States and abroad. He entered the employ of the Westinghouse Electric & Manufacturing Company in 1907 as a designer of induction motors. Later he was engaged in general engineering work and, in 1912, was placed in charge of the design of all direct-current and alternating-current railway motors. In 1917 he was assigned to do miscellaneous

R. E. HELLMUND

consulting work, which he continued until 1921, when he was appointed engineering supervisor of development. He continued in this capacity until his recent promotion.

A graduate of the University of Michigan, Mr. Dudley entered the Westinghouse company as an apprentice in 1904 and soon afterward received a position in the engineering department, where he was engaged in the design of alternating-current motors and controllers. Early in 1906 Mr. Dudley was made commercial and general engineer in the industrial and power sales department. In 1907 he was placed in charge of the alternating-current motor section, and he continued in this position until 1918, when

A. M. DUDLEY

he was placed in charge of the design of starting, lighting and ignition equipment for automobiles. In 1920 he was made manager of the automotive equipment engineering department, a post he held until 1924, when he was appointed to assist Mr. Hellmund in his work as engineering supervisor of development. Mr. Dudley has taken out numerous patents on the details of construction of electric machinery. He is the author of "Connecting Induction Motors," which is recognized as an authoritative textbook on the subject. He is a fellow of the American Institute of Electrical Engineers and past-chairman of the Pittsburgh Section of that organization and is a member of the American Society of Automotive Engineers.

Dr. Humphreys Resigns

Dr. Alexander C. Humphreys, president of the Stevens Institute of Technology, Hoboken, N. J., for nearly 25 years, tendered his resignation Oct. 21 to the trustees. Dr. Humphreys is nationally known in engineering circles not only as an educator but as chief executive of gas and electric lighting companies, which in the course of his professional career numbered more than fifty. A native of Edinburgh, Scotland, Dr. Humphreys removed to America at an early age. His first business affiliations were with insurance companies in Boston and New York, but subsequently he entered the public utility field. Connections with the Bayonne & Greenville Gas Light Company, the Pintsch Lighting Company of New York, the United Gas Improvement Company and the firm of Humphreys & Glasgow, engineers, London and New York, followed. In the meantime Dr. Humphreys had become a student at Stevens and was graduated in 1881. He became the institute's second president in 1902 and president of the board of trustees in 1907. He has contributed frequently to engineering literature and has been active in association work, being a past-president of the American Society of Mechanical Engineers, a fellow of the American Institute of Electrical Engineers and a member of the American Society of Civil Engineers and the American Institute of Mining and Metallurgical Engineers. Dr. Humphreys will remain in office until the completion of his twenty-fifth year, June 5, 1927.

H. C. Blackwell Becomes President of Cincinnati Utility

H. C. Blackwell, for more than two years vice-president of the Union Gas & Electric Company, Cincinnati, in charge of operations, has been made president of the company to succeed W. W. Freeman, who becomes chairman of the board of directors. Mr. Freeman has relinquished the duties of chief executive after ten years of service because of the enlarged responsibilities which the recent merger of the Columbia Gas & Electric Company with the Ohio Fuel Corporation has thrown upon him as a vice-president of the Columbia organization. Mr. Blackwell is known throughout the country in the electric light and power field, having been president of the Missouri Association of Public Utilities and one of the active leaders of the National Electric Light Association.

For six years prior to his connection with the Union Gas & Electric Company, Mr. Blackwell had been vice-president and general manager of the Kansas City Power & Light Company, having charge of construction and operations. In this capacity he was closely identified with the Kansas City

H. C. BLACKWELL

development, which proved to be one of the most successful of the larger electric enterprises in the country. His early experience included connections with the Wabash Railroad Company, J. G. White & Company and with the People's Light Company at Davenport, Iowa. In the last-named company he advanced from engineer to the position of vice-president and general manager.

C. W. DeForest, who has been connected with the Union Gas & Electric Company, supervising the designing

and construction of the company's power houses, has been promoted to a vice-presidency. **P. G. Vondersmith,** who was assistant to the general manager, has been named assistant general manager.

M. A. Pooler, vice-president and general manager of the New Brunswick Power Company, St. John, N. B., has resigned to accept a public utility post in the United States. His position will be filled by W. H. Swift, Jr., who has been associated with the Westinghouse Electric & Manufacturing Company.

L. C. Hitzeroth has become affiliated with the Delta-Star Electric Company, Chicago, where his broad experience in the public utility field will make him a valuable addition to the engineering staff. For the past three years he has been connected with the engineering department of the Public Service Production Company of Newark, N. J., and previous to that connection he was with the Southern Sierras Power Company and the Great Western Power Company for many years. Mr. Hitzeroth is a native Californian and a graduate of the University of Nevada.

Obituary

Judge William Hamilton Felton, president of the utility companies at Macon, Ga., died suddenly Oct. 19 in his sixty-seventh year. Mr. Felton was one of the best-known citizens of central Georgia. At one time he was dean of the law school at Mercer University and later served as judge of the Bibb County Superior Court. For many years he had been president of the Central Georgia Power Company and the Macon Railway & Light Company.

Isaac Elkas, special fan representative for the Wagner Electric Corporation of St. Louis, died Oct. 15 at his father's home at Leota Landing, Miss. Mr. Elkas was well known to the electrical trade, was a graduate of the University of Illinois, for three years was district manager of the Sprague Electric Company of St. Louis and for twelve years was district manager of the St. Louis and Chicago offices of the Robbins & Myers Company.

John A. Prouty, one of the best known public utility operators in northern New England, died recently of typhoid fever. Mr. Prouty was formerly president of the Bradford (Vt.) Electric Light Company and at the time of his death was president and general manager of the Newport (Vt.) Electric Light Company. He was about 36 years of age and was a son of the late Charles A. Prouty, at one time chairman of the Interstate Commerce Commission. John A. Prouty retired from the Bradford company a few months ago upon its sale to the Insull interests.

Thomas P. Ireland, electrical engineer in the service of the Hollinger Consolidated gold mine of Porcupine, Ontario, died of exposure Oct. 19, while on a duck-hunting expedition at Gold Lake in company with Ernest Tate, also employed by the Hollinger. Alarmed at their continued absence from camp, a companion set out in search of them and discovered their bodies lying across their upturned canoe. Mr. Ireland, who was 37 years of age, was born in Hamilton, Ontario, and in 1915 was graduated from the University of Toronto with the degree of B. Sc. After practicing his profession in Hamilton he received the appointment of electrical engineer at the Hollinger, seven years ago.

John Fredholm, distinguished Swedish engineer, died in Stockholm Aug. 12. Mr. Fredholm had been for sixteen years with the Swedish General Electric Company of Vesteras and since 1919 had been managing director of the A.-B. Skandinaviska Elektricitetsverket, Stockholm.

Recent Court Decisions

Municipality Held to the Same Standards of Integrity as Individuals.—The Nebraska Supreme Court has ordered the village of Oshkosh to pay to Robert C. Wood, a contractor who built its electric lighting plant, the sum of $10,682, balance due. In deciding the controversy the Supreme Court said that in Nebraska it is no longer an open question that villages have both governmental and proprietary or business powers and that the furnishing of a municipal utility is within these latter powers. That being true, a municipality will be held to the same business integrity that the law requires of any other corporation. There is no legal reason, it added, and certainly no moral reason, why municipal corporations should be permitted to reap the benefits of a fully completed contract and escape liability under a technical plea. Oshkosh had been served by a small private plant which the citizens voted to purchase and reconstruct. Bonds were issued to the limit, and then city warrants, which were later to be taken care of by a refunding bond issue, were authorized by the municipal authorities. Although when the legality of this procedure was tested in the courts the issue of city warrants was enjoined, the village board notwithstanding told Wood to go ahead and complete his contract. Then, according to testimony, the municipal authorities sought to escape payment by claiming that what was done was beyond the corporate powers of the village.

Disposition of Surplus Earnings from Hetch Hetchy Plant.—Uhl vs. Badaracco was a suit over the disposition by the city of San Francisco of surplus funds accruing by reason of payments made to the city by the Pacific Gas & Electric Company for energy distributed by that company over its system. The California Supreme Court issued a peremptory writ of mandate, holding that such funds could not be employed to make extensions and improvements until after the interest and sinking-fund requirements had been provided. The court concluded a long argument as follows: "To the suggestion of respondents that it is extremely important in the operation of a municipal project that the surplus revenue be used at times to make ordinary extensions and improvements to the system, to keep pace with the growing demand, it is sufficient to say that the extensions here contemplated are not ordinary, involving as they do the alleged expenditure of nearly two million dollars. The charter provides in what manner such extensions may properly be made. It is for the voters to say whether they are ready at this time to assume the costs of such extension. As stated by petitioner, it would seem to be a useless expenditure of funds in the absence of a distributing plant, the acquisition or construction of which, considering its enormous cost, might possibly never be sanctioned by the taxpayer. However this may be, the power plant being but an incident of the water project, its extension under the circumstances must be provided for by a bond issue with the approval of the taxpayers, there being insufficient surplus earnings after satisfying the charter requirements to pay for such extensions. Any other conclusion would circumvent the express mandatory requirements of the organic law of the city. This being so, there is not authority in respondents to make the contemplated expenditure at this time, as surplus earnings of a public utility cannot be employed to make extensions and improvements until after the interest and sinking-fund requirements have been provided for."

Commission Rulings

Allowance for Organization Expense in Valuation.—The right to an allowance for organization expense was considered by the Idaho Public Utilities Commission in a case affecting the Salmon River Power & Light Company, and the commission said: "In valuing the property of a public utility an allowance should be made for organization, which is a value attaching thereto, resulting by reason of such organization. The term 'organization' means more than merely the ordinary processes of forming or organizing a corporation. Before a corporation is organized, individuals must conclude to form such organization after the proposed field has been carefully looked over and canvassed, in order to obtain the facts necessary to determine whether the venture would be successful or otherwise. Plans have to be formulated and detailed preliminaries carefully gone into before organization, and in case it is concluded to organize a corporation under the laws of a state to render public service, the individuals composing the same are obliged either to stand ready to invest their own money or to seek and obtain capital elsewhere. The amount of the expense and value thereof are conditioned to some extent upon the location of the territory in which the utility is to function."

Financial and Corporate

Market Is Steady and Firm

But Very Little Activity Is Recorded During Week—No Important Price Changes

ONE of the most interesting features of the week, affecting the markets in general and reflecting the state of business, was the publication of the earnings statements of the country's two leading industrial concerns, General Motors and United States Steel. Nine months' earnings of the former showed an 83 per cent gain over last year, and a gain of almost 40 per cent was shown for the Steel company. The opinion is fairly general that this creditable showing represents a discounting of fall business as reflected in the strength of these stocks. Even if such be the case, their continued strength shows general confidence in the continuance of those factors in business and industry which have made such a showing possible—at least for the immediate present. This has a bearing on the power and light industries.

There has been no outstanding movement either one way or the other in the markets for public utility securities. Demand has been quite limited and there is no very great supply offering. The result is a small volume of trading. Expectations in certain quarters that some securities would be depressed as a result of criticism of the industry by Professor Ripley of Harvard have not been borne out. There have been just as many gains as losses during the week, and certain issues which came in for criticism in the *Atlantic Monthly* article have been among the strongest.

Very few price changes either among common or preferred issues are worth recording. American Gas & Electric common made a substantial gain to 107¼ and reacted to around 104. Cities Service was also among the gains. The bond market remains more or less featureless.

Malone Utility Increases Capital.—The Malone (N. Y.) Light & Power Company has filed a certificate in the office of the Secretary of State increasing its capital stock from 18,000 shares, consisting of 3,000 shares preferred stock $100 par value and 15,000 shares common stock no par value, to 33,000 shares, consisting of 3,000 shares preferred stock $100 par value and 30,000 shares common stock no par value.

Customer Sales Reach $19,000,000 in August

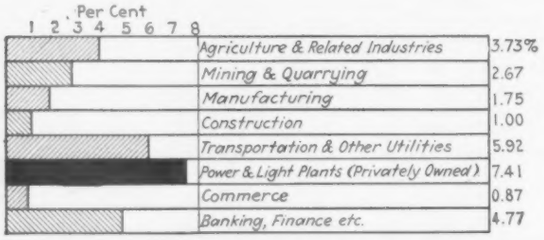
Based upon monthly reports received by the ELECTRICAL WORLD from electric light and power companies selling stock direct to their customers and employees, it is estimated that during August a total of 264,000 shares were sold in this manner. The value of the stock sold is estimated at $19,000,000. A total of 25,000 customers took part in the sales during August.

Power and Light Companies Overtaxed

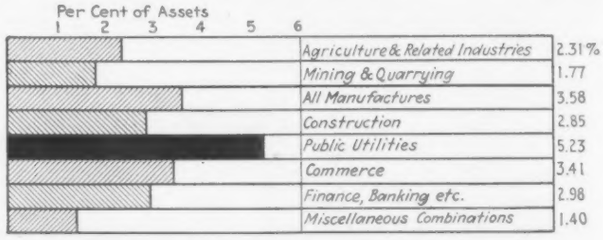
Pay Largest Proportion of Revenue Toward Country's Tax Bill, Although Return on Capital Is Much Smaller than in Other Lines of Industry

BY H. M. CAMERON
Financial Editor

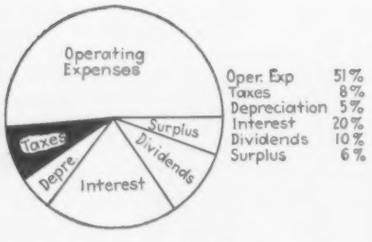
TO "PLUCK the most feathers with the least squawking" is a crude characterization sometimes applied to the policy pursued by tax authorities in obtaining public funds. Power and light industries evidently are not addicted to "squawking," for they are paying a great deal more than their just share of the national tax bill and are complaining little. They are assessed at higher rates than other tangible properties. Such assessments, moreover, are usually more rigidly adhered to with large corporations such as public utilities than with smaller and less conspicuous properties. Central power and light plants pay a larger proportion of their revenue in taxes than is done by other utilities, though the latter pay a considerably higher proportion than most other lines of industry. This is caused partly by the inability of the utility companies to transfer their operations to another


Per Cent
1 2 3 4 5 6 7 8
Agriculture & Related Industries 3.73%
Mining & Quarrying 2.67
Manufacturing 1.75
Construction 1.00
Transportation & Other Utilities 5.92
Power & Light Plants (Privately Owned) 7.41
Commerce 0.87
Banking, Finance etc. 4.77

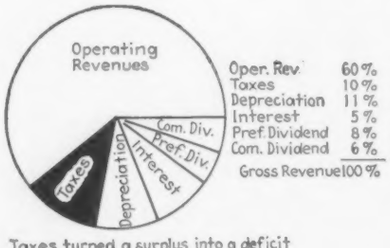
Power and light utilities contribute much larger proportion of gross earnings to national tax bill than any other group.
(From data compiled by National Industrial Conference Board)



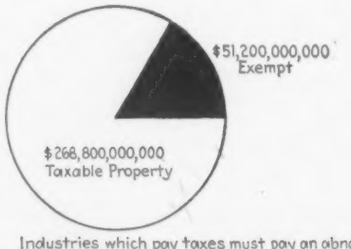
Public utilities contribute much larger portion of their assets in taxes than any other group.
(From data compiled by National Industrial Conference Board)



Distribution of gross revenues of an Eastern Utility



Taxes turned a surplus into a deficit in this company.
Distribution of gross revenues of a Pacific Coast Utility



Industries which pay taxes must pay an abnormally large share since 16 per cent of all wealth in U.S. is exempt. (Tax exempt securities are said to reach an aggregate of $30,000,000,000)

COMPARISON OF TAX BILL OF POWER AND LIGHT COMPANIES WITH THAT OF OTHER INDUSTRIES AND PROPORTION OF EARNINGS PAID ANNUALLY IN TAXES

TABLE I—REVENUE AND TAXES OF ALL CORPORATIONS IN UNITED STATES—1923

(Source, United States Bureau of Internal Revenue)

	Per Cent Taxes to Gross Receipts			Per Cent Taxes to Net Revenue		
	Income and Profits	Other	Total	Income and Profits	Other	Total
Agriculture and related industries	1.26	2.47	3.73	14.97	29.24	44.21
Mining and quarrying	0.63	2.04	2.67	22.07	71.18	93.25
Manufacturing	0.86	0.89	1.75	11.01	11.38	22.39
Construction	0.51	0.49	1.00	12.87	12.37	25.24
Transportation and other public utilities	1.43	4.49	5.92	7.97	25.01	32.98
Trade	0.40	0.47	0.87	11.33	13.40	24.73
Public service, professional amusements, hotels, etc.	0.84	1.85	2.69	11.02	24.20	35.22
Finance, banking, insurance	1.09	3.68	4.77	7.34	24.86	32.20

TABLE II—REVENUE AND TAXES OF CLASS I RAILWAYS IN UNITED STATES—1923-24

(Source, official summaries by Interstate Commerce Commission published by Bureau of Railway Economics)

	1923	1924
Operating revenues	$6,289,580,000	$5,921,490,000
Other income	260,655,000	272,989,000
Gross receipts	6,550,235,000	6,194,479,000
Net income (after taxes)	554,995,000	562,303,000
Taxes	331,915,000	340,337,000
Net profits (before taxes)	886,910,000	902,640,000
Percentage:		
Taxes to gross receipts	5.07	5.49
Taxes to net profits	37.42	37.70

TABLE III—REVENUE, PROFITS AND TAXES OF CENTRAL ELECTRIC LIGHT AND POWER STATIONS

(Source, United States Bureau of Commerce, 1922)

	Commercial	Municipal	Total
Total revenue (including estimated value free service)	$986,684,000	$85,436,000	$1,072,120,000
Total expenses (including depreciation and taxes)	787,432,000	64,877,000	852,309,000
Net income after taxes	199,252,000	20,559,000	219,811,000
Taxes	73,128,000	645,000	73,773,000
Net profits before taxes	272,380,000	21,204,000	293,584,000
Percentage:			
Taxes to gross receipts	7.41	0.75	6.88
Taxes to net profits	26.85	3.04	25.13

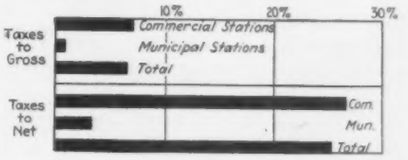
part of the country and partly by the fact that 16 per cent of the total wealth of the United States is exempt from taxation. The taxable balance must pay a heavier toll. The public must be educated to the unfairness of the situation as a first attempt toward bringing about more equitable distribution of the tax burden.

The fact that the power and light companies must have a much larger capital invested in relation to their earnings than most other industries would seem sufficient handicap in itself. Rather than receiving consideration on these grounds, the very existence of their large properties leads to their being charged higher taxes than most other industries. The property factor rather than the income factor dominates. The unfairness of this is evident but has received remarkably little public attention. A study recently completed by the National Industrial Conference Board shows startling results in this regard.

Its analyses of statistics compiled by the United States Bureau of Internal Revenue show that in 1923 that group of companies comprising transportation and other public utilities expended 5.92 per cent of gross receipts for taxes—a larger proportion than that of any other industrial group, the average for all corporations being only 2.16 per cent. If taxes other than federal, income and profits taxes be considered by themselves, the percentage of gross receipts for transportation and other public utilities is 4.49, which is again much higher than the proportion for any other industrial division. Light and power corporations that operated at a profit, excluding transportation and other utilities groups, contributed 6.09 per cent of gross receipts for taxes—a greater percentage than that for any other group.

Proceeding by the process of elimination, let us rule out the transportation agencies. As already stated, the group contributed 5.92 per cent of gross in 1923. Official statements of the Interstate Commerce Commission, as published by the Bureau of Railway Economics, showed that steam railways in the United States disbursed 5.07 per cent of their gross receipts in taxes in 1923 and 5.17 per cent in 1922. Since these percentages are somewhat smaller than those for transportation and public utilities combined, and since steam railways overshadow all other transportation systems in importance, it follows that the percentage of gross receipts of public utility corporations expended for taxes must be greater than the proportion for the combined group mentioned above. Otherwise expressed, the conclusion already drawn that these corporations in the transportation and public utilities group disburse a greater share of their gross receipts than the average for any other major industrial group is true by even a greater margin for public utility corporations considered by themselves.

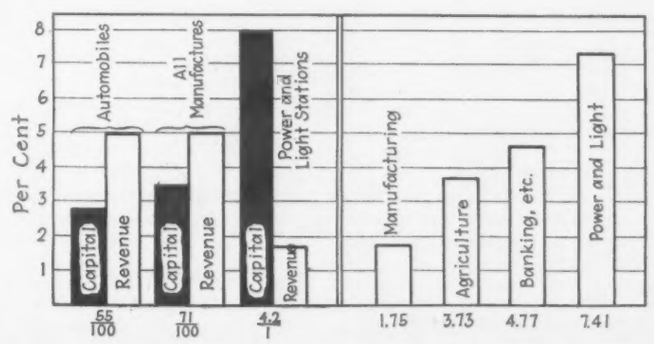
Further evidence of the accuracy of the above statement as regards electric light and power industries is gleaned from the United States Census of Electrical Industries taken in 1922. According to statistics there presented, the central light and power stations disbursed in 1922 an average of 6.88 per cent of gross earnings in taxes. Municipal plants, generally exempt from taxation, paid only 0.75 per cent of gross income, while privately owned utility plants paid 7.41 per cent. For the same year central light and power stations paid 26.85 per cent of net revenue for tax disbursement.



PROPORTION OF GROSS AND NET EARNINGS PAID IN TAXES

The same result is shown from a study made by the ELECTRICAL WORLD of ten representative companies, reports of which show that taxation took an average of 7.1 per cent of gross revenues and 18.4 per cent of net. Among the companies chosen one showed taxes of 10.7 per cent of gross revenue and 29.6 per cent of net. Another showed taxes amounting to 10 per cent of gross and 26 per cent of net. These companies were in widely separated sections of the country. One company which reported a deficit for the year paid 9.5 per cent of gross and 23 per cent of net in taxes.

There are probably various reasons for this apparently unfair impost upon power and light companies. In the first place, they are immobile. Properties of this nature cannot change their location at will, and there are therefore possibilities of assessing the special kinds of properties owned by public utilities at unusually high rates. Executive attention in these industries has been directed to this problem for some time, but a solution has not yet been found. There is at least one general factor affecting all taxable properties; that is, the large volume of



CAPITAL TURNOVER SLOWER IN POWER AND LIGHT COMPANIES THAN IN OTHER INDUSTRIES. SECOND HALF OF CHART SHOWS PERCENTAGE OF GROSS REVENUE PAID IN TAXES

untaxed property. It is estimated that the total wealth of the United States is not far from $320,000,000,000, of which more than $50,000,000,000, or about 16 per cent, is entirely or partly exempt. Approximately 60 per cent of the exempt amount is stated to be in securities, while the balance is in real estate and other properties publicly owned or belonging to educational or other institutions. As urged by Nash in "Economics of Public Utilities," the effect of this huge volume of exemption is to make the rate of those who pay taxes at least 10 per cent higher than if all except government-owned properties were taxed. Public utilities are also subjected to business licenses, income taxes, capital-stock taxes and additional imposts similar to those of other business corporations, but, in addition, utilities are subject to assessments and imposts of a special character to which general business is not subject or is subject only to a restricted degree. The whole problem is one which demands executive attention with a view to securing a greater degree of uniformity in taxes of all corporations.

Executive attention has been directed to this problem in the past in a general way, but little has been done in the way of placing before the public a vivid picture of the unfairness of the present tax situation. The only way to gain public sympathy and support in attaining this result is the presentation of accurate and convincing evidence that the situation is as stated. The light and power utilities are glad to pay their proportionate share of taxes and the facts quoted merely call attention to an unfair distribution of these taxes.

New Capital Issues Offered on Large Scale

During the week ended Oct. 28 several new electric light and power issues of sizable amounts were offered. The Alabama Power Company contributed $6,000,000 to the total in the form of first mortgage lien and refunding gold bonds, priced at 98½ and interest, to yield about 5.10 per cent. These 5 per cent bonds were dated Nov. 1, 1926, to mature Nov. 1, 1956. In addition to being secured by a general mortgage on the entire property of the company, these bonds are secured by the pledge of $39,302,000 of its first mortgage 5 per cent bonds and $1,276,000 (closed mortgages) underlying divisional bonds. No additional first mortgage bonds, of which $10,221,000 are now outstanding with the public, can be issued except for pledge as further security for the first mortgage lien and refunding bonds.

With the purpose of retiring outstanding bonds the Central Maine Power Company floated a three-million-dollar issue of first and general mortgage gold bonds, series D, the price being 100 and interest, yielding 5 per cent. These bonds are dated July 1, 1925, and fall due July 1, 1955. They are secured by a first mortgage on the electric, gas and railway properties in Rockland, Thomaston and Camden, together with certain local distributing systems in other communities and on real estate controlling valuable undeveloped water-power sites, and also by a mortgage on the entire remaining physical property of the company subject to $4,379,000 first mortgage and $500,000 other divisional lien bonds. Net earnings of the Central Maine company for the year ended Sept. 30, 1926, totaled $2,093,106, or two and seven-eighths times annual bond interest charges.

A short-term offering of 5½ per cent

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Oct. 26	Low 1926	High 1926
ABITIBI PWR. & PAPER, com.			
—no par	91	....	....
Adirondack Pwr. & Lt.—7% pf.	103½	....	....
Adirondack Pwr. & Lt.—8% pf.	112	....	....
Ala. Pwr., pf.	106½	....	....
Allis-Chalmers Mfg. pf.	k109	105	110½
Allis-Chalmers Mfg., com.	85	78½	94½
Aluminum Co. of Amer., com.	70	....	....
Aluminum Co. of Amer. pf.	101	....	....
Amer. & Foreign Pwr., pf. 25% pd.	m110	....	....
Amer. & Foreign Pwr., 7% pf.—no par	85	79	98
Amer. & Foreign Pwr., com.—no par	15	14½	42½
Amer. Bosch Magneto, com—no par	17½	16	34½
Amer. Brown, Boveri, Elec.	38½	30½	50
Amer. Brown, Boveri, Elec., pf.	95½	86½	97½
Amer. Elec. Pwr., pf.	m111	102	111
Amer. Gas & Elec., 6% pf.—no par.	95½	....	....
Amer. Gas & Elec., com.—no par.	104½	64	110½
Amer. Lt. & Trac., 6% pf.	110	105	115½
Amer. Lt. & Trac., com.	210	193	263
Amer. Pwr. & Lt., 6% pf.	97½	....	....
Amer. Pwr. & Lt., com.—no par.	m 66½	50½	72
Amer. Pub. Serv., 7% pf.	a 97½	92	99
Amer. Pub. Serv., com.	50	45	80
Amer. Pub. Utilities, 6% pf.	78	....	....
Amer. Pub. Utilities, 7% pf.	92	....	....
Amer. Pub. Utilities, com.	68	....	....
Amer. States Sec., A	2½	....	....
Amer. States Sec. B	2½	....	....
Amer. Superpwr., pf.—25	25½	23	26½
Amer. Superpower, pf.	k 95	....	....
Amer. Superpwr., Class A—no par.	28½	19½	37½
Amer. Superpwr., Class B—no par.	l 95	21½	39
Amer. Wtr. Wks. & Elec., 7% pf.	k104½	101½	108½
Amer. Wtr. Wks. & Elec., com.—20.	51	43½	74
Anaconda Copper	47½	41½	51½
Appalachian Elec. Pwr., 7% pf.	98	90	101
Appalachian Elec. Pwr., 2d pf., 7%.	98	99	102
Appalachian Elec. Pwr., com.	78	78	83
Arizona Pwr., 7% pf.	61	....	....
Arkansas Cent. Pwr., pf., $7—no par	k104	99	107
Arkansas Lt. & Pwr., 7% pf.	102	....	....
Arkansas Lt. & Pwr., com.	100	110	115
Asheville Pwr. & Lt., 7% pf.	l107	100½	107½
Assoc. G. & E., pf.—$3.50—50	50	....	....
Assoc. Gas & Elec., pf.—$6—no par	83	....	....
Assoc. Gas & Elec., Class A—no par	35	25½	38½
BABCOCK & WILCOX, com.	113	....	....
Binghamton Lt., Ht. & Pwr., pf.	90	92	95
Birmingham Elec. pf.—$7—no par.	105	....	....
Blackstone Valley Gas & Elec., pf.	103	103	106
Blackstone Valley G.&E., com.—50.	102	100½	106
Blaw-Knox, com.	t 71	45	80
Brazilian Trac., Lt. & Pwr., com.	f108½	....	....
Broad River Pwr., pf.	94	....	....
Brooklyn Edison, com.	k154	133	163
Buffalo, Niagara&East Pwr.,pf.—25.	l 24½	....	....
Buffalo, Niagara & Eastern Pwr., com.—no par.	l 30	....	....
CALIFORNIA ELEC. GENERATING, pf.	93	89	95
California Ry. & Pwr., pf.	195	88	130
Carolina Pwr. & Lt., pf.—$7—no par	107	....	....
Cent. & S. W. Ut. 7% pf.—no par	a 93	89½	96½
Cent. & S. W. Ut., pr. In. pf.—no par	a 99	93	100
Central Ariz. Lt. & Pwr., pf.	104	....	....
Central Ark. Ry. & Lt., 7% pf.	100	....	....
Central Ill. Pub. Serv., 6% pf.	a 88½	87	91
Central Ind. Pwr., 7% pf.	87	85	93½
Central Pwr. & Lt., pf.	100	....	....
Central States Elec., 7% pf.	91	....	....
Central States Elec., com.	m200	200	230
Century Elec., com.	b117	110	117
Chicago Fuse Mfg., com., no par.	a 32	30	35
Cincinnati Gas & Elec., com.	g 90½	88	95
Cities Service, 6% pf.	l 90½	86½	90½
Cities Service, pf.B—10.	l 8	7½	8
Cities Service, pf. BB—100.	l 81	74	81
Cities Service, com.—20.	l 47½	37½	47½
Cities Service, Bks. Shrs.—10.	l 23½	19½	23½
Clarion River Pwr., pf.	95	93	95
Cleveland Elec. Illg., 6% pf.	107½	....	....
Cleveland Elec. Illg., com.	296	....	....
Colorado Pwr., 7% pf.	k 95	96	97
Columbia Gas & Elec., 7% pf.	114½	111½	115½
Columbia Gas & E., com.—no par.	86½	63½	90
Columbia Ry., Gas & Elec., 6% pf.	90	65	96
Columbus Elec. & Pwr., 2d pf.	104½	....	....
Columbus Elec. & Pwr., com.	240	....	....
Columbus Ry., Pwr. & Lt., 1st pf.	98½	....	....
Columbus Ry., Pwr. & Lt., pf. B.	93½	....	....
Col. Ry., Pwr. & Lt., com.—no par.	69½	....	....
Commonwealth Edison, com.	a137	135½	145
Commonwealth Pwr., 6% pf.	k89½	82	89
Commonwealth Pwr., com—no par.	39½	28½	48½
Conn. Lt. & Pwr., 8% pf.	117	....	....
Conn. Lt. & Pwr., 7% pf.	108	....	....
Cons. Gas of N. Y., pf.—50.	58½	....	....
Cons. Gas of N.Y., com.—no par.	107	87	115½
Cons. Gas Elec. Lt. & Pwr. of Balti., 6% pf.	e106	102	107½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 6½% pf.	e110½	108½	111½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 7% pf.	e113½	109	113½
Cons. Gas, Elec. Lt. & Pwr. of Balti. 8% pf.	e127	124	128½
Cons. Gas, Elec. Lt. & Pwr. of Balti. com.—no par.	e~52½	45	57½
Cons. Pwr. & Lt., 7% pf.	103	....	....
Consumers Pwr., 6% pf.	98	....	....
Consumers Pwr., 6.6% pf.	104	....	....
Continental Gas & Elec., 7% pfc. pf	100	....	....
Continental Gas & Elec., 7% pr. pf.	97½	....	....
Continental G.&E., com.—no par.	165	....	....
Crocker Wheeler, com.	21	....	....
Crocker Wheeler, pf.	80	....	....
DALLAS PWR. & LT., 7% pf.	107	....	....
Dayton Pwr. & Lt., 6% pf.	100	....	....
Detroit Edison, com.	138	123½	141½
Dubilier Condenser com.—no par.	4½	3½	11
Dubuque Elec., 6% pf.	k 94	93	98½
Duquesne Lt., 7% pf.	115½	111½	116½
EAST, N. Y. UTIL, pf.	100	100½	104½
Eastern New York Util., com.	65	70	75
Eastern States Power.	13	....	....
Eastern States Power, pf.	89	....	....
Eastern Tex. Elec., 7% pf.	105	....	....
East. Tex. Elec., com.—no par.	75	70	80
Edison Elec. Illum. of Boston, com.	d221	207	250
E. Paso Elec., com.—no par.	70	70	94
E. Paso Elec. pf.	103	....	....
Elec. Bond & Share, 6% pf.	l106½	103½	109½
E. Bd. & Share Sec., com.—no par.	l 65½	56½	86
El. Household Util.	a 13	11½	25
Elec. Investors, 6% pf.—no par.	91	....	....
Elec. Investors, com.—no par.	37½	30½	74½
Elec. Investors, 10% pd. receipts.	25	12	56
Elec. Pwr. & Lt., ctfs. pf.	k 94½	89½	98½
Elec. Pwr. & Lt., ctfs. 40% pd.	k101½	99½	115
Elec. Pwr. & Lt., ctfs. full pd.	k101½	102½	110½
Elec. Pwr. & Lt., ctfs., com—no par.	15½	15½	34½
Elec. Refrig.	45	43½	78½
Elec. Ry. Securities, com.—no par.	k 5½	4½	10
Elec. Storage Battery, com.—no par.	84½	71½	94½
Elmira Wtr., Lt. & R. R., 7% pf.	98	98	101½
Emerson Elec., pf.	b101	100	104½
Empire Dist. Elec., 6% pf.	l 88	82	88
Empire Power, A.	26	....	....
Engr. Pub. Serv., pf.—no par.	93½	93	96½
Engr. Pub. Serv., com.—no par.	19½	19½	24½
Eureka Vac. Cleaner, com.—no par.	k 51	43	56
FAIRBANKS MORSE, pf.	42½	40½	59½
Fairbanks Morse, com.—no par.	k 43	40½	59½
Federal Lt. & Trac., com.	k 39½	28	39½
Federal Light & Traction, pf.	k 90	86	91½
Federal Utilities, pf.	m 70	....	....
Federal Utilities, com.	m 17	....	....
Ft. Worth Pwr. & Lt., 7% pf.	l107½	105	108½
GALVESTON-HOUSTON ELEC., 6% pf.	60	....	....
Galveston-Hstn. El., com.	21	....	....
Gen. Elec., com.	82½	79	95½
Gen. Elec., special—10.	11½	11	11½
Gen. G.&E., (Del.) com. A no par.	40	34	59
Gen. G.&E., (Del.) com. B no par.	m 38½	38½	48½
Gen. G.&E., (Del.) A pf. $8 no par.	k111	105½	113
Gen. G.&E., (Del.) A pf. $7 no par.	k 98	95	99½
Gen. G.&E., (Del.) pf. B.	k 94½	92½	96
General Public Service, pf.	m103	100	106
General Public Service, com.	m 12	12	16½
Ga. Lt., Pwr., & Rys., 6% pf.	90	82	98
Ga. Lt., Pwr. & Rys., com.	m 70	65	80
Ga. Ry. & Power, 8% pf.	k114	112	114
Ga. Ry. & Power, 7% pf.	106½	....	....
Ga. Ry. & Pwr., 4% pf.	m120	105	145
Ga. Ry. & Pwr., com.	120	....	....
Gt. Western Pwr., 7% pf.	h102	....	....
IDAHO PWR., 7% pf.	103	....	....
Ill. No. Utilities, 6% pf.	a 91½	90	92½
Ill. Pwr. & Lt., 7% pf.	98	....	....
Ingersoll Rand.	92	80½	105
Int. Combus. Engr., com.—no par	39½	33½	64½
Int. Utilities, class A—no par.	k 30	25	39
Int. Utilities, class B—no par.	k 4½	3½	9½
Interstate Pwr., pf., no par.	92	....	....
Interstate Pub. Serv., 7% pf.	97	96½	99
Iowa Ry. & Lt., 7% pf.	95	98	100
JERSEY CENTRAL PWR. & LT., 7% pf.	96	....	....
Jersey Central Pwr. & Lt., pfc., pf.	108	95½	112
Jersey Central Pwr. & Lt., com.—no par.	k 45	45	50
Johns-Manville, com.—no par.	140	130	165

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high. Saturday, Oct. 23. lBid, low, high, Wednesday, Oct. 27. mLatest quotations available.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday Oct. 26	Low 1926	High 1926
KANSAS CITY PWR. & LT., pf.	k112	107¼	112¼
Kansas Gas & Elec., 7% pf. ex. div.	l103½	99	103½
Kentucky Hydro-Elec., pf.	a 93½	91¼	95½
Kentucky Sec.,6% pf.	80	..	....
Kentucky Sec., com.	100½	....	....
Kentucky Utilities, 6% pf.	93	90	95
Keystone Pwr. & Lt. 7% pf.	96	95	97
LACLEDE GAS LT., com.	162	146	175½
Lehigh Pwr. Sec., com.—no par	14½	10	22
Long Island Ltg., 7% pf.	108½	....	....
Long Island Ltg., com.—no par	130	120	150
Los Angeles Gas & Elec., 6%,pf.	99	....	....
Louisville Gas & Elec., Class. A	24	22¼	26¼
MANHATTAN ELEC. SUPPLY.	53	44	87½
Manila Elec., com.—no par	k 38	27¼	45½
Maytag Mfg., com.	23½	19	24½
Memphis Pwr. & Lt., pf., $7, no par	108	103	110
Metro. Edison, pf.—$6—no par	93	....	....
Metropolitan Edison, pf., $7, no par.	104½	....	....
Metropolitan Edison, com., no par.	50	45	52
Middle West Utilities, 7% pf.	a105	97¼	111¼
Middle West Utilities, 7% pr. lien pf.	a115	106½	123½
Middle West Utilities, com.—no par.	a111½	108	134½
Midland Utilities, pr. lin. pf.	a100	98	104
Midland Utilities pf. A	a 97	96	99½
Milwaukee Elec. Ry. & Lt., 7% pf.	98	100	102
Milwaukee Elec. Ry. & Lt., 6% pf.	91	87	88½
Minn. Pwr. & Lt., 7% pf.	l104½	100	104½
Miss. Pwr. & Lt., pf.	106½	....	....
Miss. River Pwr., 6% pf.	93	....	....
Miss. River Pwr., com.	60	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	103½	99	105
Mohawk Hudson Pwr., 2nd pf.—$7—no par	98½	....	....
Mohawk Hudson Pwr., com.—no par	22½	20½	28½
Montana Pwr., pf.	m117½	112½	119½
Montana Pwr., com.	79½	69½	83½
Montreal Pwr., com.	f 74½	....	....
Mountain States Pwr. pf.	96	....	....
Mountain States Pwr., com.	18	....	....
NASSAU & SUFFLOK, LTG., pf.	99	....	....
National Carbon, pf.	m125½	125	128
National Electric Pwr-A.	a 22	19½	26½
National Elec. Pwr., pf.	a93½	92	96½
Nat. Lt., Ht. & Pwr., com.	24	22	25
National Lt., Ht. & Pwr., 5% pf.	72	71	73
National Pwr. & Lt., pf., $7—no par.	101½	96	102½
National Pwr. & Lt., com.—no par.	19½	16½	38½
National Pub. Serv., 7% pf.	89	....	....
National Pub. Serv., pfc. pf.	110	....	....
National Pub. Serv., A com.—no par.	k 18½	15½	24
National Pub. Serv., B com.—no par.	k 13½	10	16½
Nebraska Pwr., 7% pf.	l107½	103	107½
Nevada-Calif., Elec., com.	k 20½	18½	44½
New Brunswick Pwr., pf.	55	30	55
New England Pub. Serv., pr. ln. pf.	99½	98	99½
New England Pub. Serv., pf.	93	95½	97
N. J. Pwr. & Lt., 7% pf.	109½	104	110
New Orleans Pub. Serv., 7% pf.	103	....	....
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	89	....	....
N. Y. Central Elec., 7% pf.	98½	98	100
Newport News & Hampton Ry., Gas & Elec., com.	109	98	112
Newport News & Hampton Ry., Gas & Elec., pf.	109	98	114
Niagara Falls Pwr., 7% pf.—25	28½	27½	28½
Niagara, Lock. & Ont. Pwr., 7% pf.	109	110	111½
No. Amer., 6% pf.—50	k 50½	49	52½
No. Amer., com.—10	48½	42	67
No. Amer. Edison pf.—no par	96	91½	96½
No. Amer. Lt. & Pwr., pf.	101	88	104
No. American Utilities, pf., full pd.	m 94½	89	96
No. American Utilities, pf., 25% pd.	m 19	18	27
N.C. Pub. Serv., pf.—$7—no par.	93	....	....
Northeastern Pwr., com.	16½	15½	36½
No. Indiana Gas & Elec., pf. A.	100½	98	103½
No. Indiana Public Service—pf.	100½	....	....
No. N. Y. Utilities, 7% pf.	103	....	....
No. Ohio Pwr., com.—no par	12	11	26½
No. Ohio Trac. & Lt., 6% pf.	78	78	81
No. Ohio Trac. & Lt., 7% pf.	92	88	96
No. Ont. Lt. & Pwr., pf.	83	....	....
No. Ont. Lt. & Pwr., com.	73	45	75
No. States Pwr., 7% pf.	102½	99½	103¾
No. States Pwr. com.	103	97	136½
No. Texas Elec., 6% pf.	62	....	....
No Texas Elec., com.	19	....	....
OHIO BRASS, com. B—no par	68	70	79
Ohio Brass, pf.	100	98	101
Ohio Gas & Elec., 7% pf.	94	92	95
Ohio Pwr., 6% pf.	95½	93	96
Ohio Pub. Serv., 6% pf.	l 94½	90	96½
Ohio Pub. Serv., 7% pf.	l 99	96	102½
Ohio River Edison, pf.	100½	....	....
Oklahoma Gas & Elec., pf.	96	....	....
PACIFIC GAS & ELEC., 6% pf.	98½	....	....
Pacific Gas & Elec. com.	129	118	133½
Pacific Pwr. & Lt., 7% pf.	l102½	98	102½
Parr Shoals Pwr., 6% pf.	92	....	....
Penn Central Lt & Pwr. pf.—no par	c 72	70½	91
Penn-Ohio Edison, 7% pf.	96	....	....
Penn-Ohio Elec., 7% pf.	95	93	96
Penn-Ohio Pwr. & Lt., 7% pf.	98	....	....
Penn-Ohio Pwr., & Lt., 8% pf.	107	....	....
Penn Pwr. & Lt. $7—no par.	l106½	103	108½
Penn Pub. Serv., 7% pf.	103	96	103
Penn Pub. Serv., 6% pf.	87	85	90
Penn Wtr. & Pwr., com.	e162	141	171
Phila. Co., 6% pf.—50	c 49½	48½	50½
Phila. Co., com.—50	k 70	59½	76½
Phila. Elec., com.—25	c 47½	41½	67½
Pittsburgh Utilities, pf.—10	m 19½	14½	20½
Portland Elec. Pwr., 7% pf.	97	....	....
Portland Elec. Pwr., 6% pf.	83	....	....
Portland Elec. Pwr., 6% 2nd pf.	71	....	....
Portland Elec. Pwr., com.	27	....	....
Potomac Elec. Pwr., pf.	l107½	....	....
Pwr. Corp. of N.Y., com—no par.	m 79	77½	90½
Pwr. Sec., pf.—no par.	k 24	10	29
Pwr. Sec., com.—no par.	k 6	4	13
Pub. Serv. of Colorado 7% pf.	l 99	96	100
Pub. Serv. of N. J., 7% pf.	109	103½	109½
Pub. Serv. of N. J., 8% pf.	k123½	115	124½
Pub. Serv. of N. J., com.—no par.	92½	72	97
Pub. Serv. of N. J., new com.	31½	30½	32½
Pub. Serv. of No. Ill., 6% pf.	a100	99½	106
Public Serv. of No. Ill., 7% pf.	a112½	112	116½
Pub. Serv. of No. Ill., com.—no par	a129½	128	140
Pub. Serv. of No. Ill., com.	a103½	128	143
Pub. Serv. of Okla., 7% pf.	98	92	97
Pub. Serv. Elec. & Gas, 6% pf.	102½	97	104½
Public Service Elec. Pwr., pf.	k112	106	114
Puget Sound Pwr. & Lt., 7% pf.	102½	....	....
Puget Sound Pwr. & Lt., 6% pf.	83½	....	....
Puget Sound Pwr., & Lt., com.	26	....	....
RADIO CORP. OF AM., pf.—50	49	44½	49½
Radio Corp. of Amer., com.—no par.	58	32	60½
Republic Ry. & Lt., pf.	109	....	....
Republic Ry. & Lt., com.	k 88	75	97
Rochester Gas & Elec., 5% pf.	m 95	80	98
Rochester Gas & Elec., 6% pf.	k102	100	103
Rochester Gas & Elec., 7% pf.	105	....	....
SAN JOAQUIN LT. & PWR., 7% pf.	97	97½	98½
Safety Cable, com.	k 51	42½	55
St. Joseph Ry., Lt., Ht. & Pwr. pf.	67	60	70
Servel Corp.	13½	12½	22½
Sierra Pacific Elec., com.	23½	23	28½
Sioux City Gas & Elec., 7% pf.	l 99½	....	....
S. E. Pwr. & Lt., pf.—$7—no par.	99½	....	....
Southeastern Pwr. & Lt., ptc. pf.	l 67	....	....
S. E. Pwr. & Lt., com.—no par.	28½	20	46½
So. Calif. Edison, 8% pf.—25	30	32½	33½
So. Calif. Edison, 7% pf.—25	27	....	....
So. Calif. Edison, 6% pf.—25	24	....	....
So. Calif. Edison, com.	30½	30½	33
Southern Cities Utilities, 7% pf.	85	....	....
Southern Cities Utilities, com.	34½	28	49
Southwestern Lt. & Pwr., A.	60	....	....
Southwestern Lt. & Pwr., B.	60	....	....
Southwestern Lt. & Pwr., $6 pf.	80	....	....
Southwestern Pwr. & Lt., 7% pf.	103½	96½	104½
Springfield (Mo.) Ry & Lt., 7% pf.	97	95	100
Standard Gas & Elec., 8% pf.	56	53½	57½
Standard Gas & Elec., 7% pf.	101	....	....
Standard Gas & Elec., com.—no par.	53½	51	69
Standard Pwr. & Lt., 7% pf.	95	....	....
Staten Island Edison, pf.—$6—no par	96	....	....
Superheater, com.—no par.	150	....	....
Syracuse Lighting, 7% pf.	102	105	107
Syracuse Lighting, 8% pf.	115	....	....
Syracuse Lighting, com.	340	260	355
TAMPA ELEC., com.	48	....	....
Tenn. Elec. Pwr., 6% pf.	90	....	....
Tenn. Elec. Pwr., 7% pf.	103	....	....
Terre Haute, Ind. & East Trac., pf.	20	20	37
Terre Haute, Ind. & East. Trac., com	1	1	7
Tex. Pwr. & Lt., 7% pf.	l106½	102	107½
Tide Water Pwr., 8% pf.	104	....	....
Timken Roller Bearing, com—no par	53½	44½	85
Toledo Edison, 8% pf.	l113	111	113
Toledo Edison, 7% pf.	l103	101	103
Toledo Edison, 6% pf.	l 94½	90	94½
Toledo Edison, com.	100	....	....
Tri-City Ry. & Lt., 6% pf.	88	87½	89
UNITED GAS & ELEC., 6% pf.	97½	....	....
United Gas & Elec., com.—no par.	m 57	56	66
United Gas & Elec. (N.J.), 5% pf.	70	....	....
United Gas Impr.—50	c102	84½	144½
United Lt. & Pwr. pf.—$4—no par.	50½	44	51
United L. & P. pf.—$6.50—no par.	87½	81	91
United Lt. & Pwr., com., A—no par	a 11½	11	26
United Lt. & Pwr., com., B—no par	k 17	13	29
Utah Pwr. & Lt., 7% pf.	l103½	99	103½
Utica Gas & Elec., 7% pf.	105	....	....
Utica Gas & Elec., com.	200	....	....
Utilities Pwr., & Lt., 7% pf.	92	....	....
Utilities Pwr. & Lt., com A.	30	28½	37
Utilities Pwr. & Lt., com. B—no par	14½	13½	18½
VERMONT HYDRO - ELEC., 7% pf.	95½	94	96
Virginia Elec. & Pwr., 7% pf.	104	104	105½
Virginia Pwr., 7% pf.	108	102	104
Virginian Pwr., com.	70	65	75
WAGNER ELEC., pf.	b 73	61½	85
Wagner Elec., com.—no par.	b 23	13½	34½
Washington Ry. & Elec., com.	f172	....	....
Washington Ry. & Elec., pf.	f 90	....	....
Washington Wtr. Pwr., com.	132	130	136
West Mo. Pwr., 7% pf.	92	....	....
West Penn., 7% pf.	m115	108	115
West Penn, com.	m125	118	130
West Penn Elec., pf.	100	95½	101
West Penn Elec. Class A.	k 92	88½	98
West Penn Pwr., 6% pf.	99½	95	101
West Va. Lt., Ht. & Pwr., 7% pf.	94½	95	98
West Va. Util ities, 7% pf.—50	47½	43	48
Western Pwr., 7% pf.	98½	91½	99
Western States Gas & Elec., 7% pf.	92½	....	....
Western States Gas & Elec., com.	18	....	....
Westinghouse El. & Mfg., com—50.	67½	65	79½
Weston Elec. Instrument, Class A..	32½	27½	32½
Weston Elec. Instrument, com.	16	13½	19½
Wheeling Elec., pf.	94	92	96
Wis. Pwr., Lt. & Ht., 7% pf	k 90	85	90
Worthington Pump, pf. A	k 55	63	80
Worthington Pump, pf. B	k 48	50½	65
Worthington Pump, com.	26	20½	44½
YADKIN RIVER PWR., 7% pf.	l107	102	107½
Yale & Towne, com.—25	k 68½	60½	72½

Stock Exchange: aChicago; bSt. Louis; cPhiladelphia; dBoston; eBaltimore; fMontreal; gCincinnati; hSan Francisco; iPittsburgh; jWashington. kBid, low, high, Saturday, Oct. 23. lBid, low, high, Wednesday, Oct. 27. mLatest quotations available.

secured gold notes was made by the Colonial Gas & Electric Company, a piece of financing involving $2,000,000. The company, through its subsidiary or controlled companies, supplies electric light and power to Derby, Shelton and Ansonia, Conn., Newport, Jamestown, Middletown and Portsmouth, R. I., and gas to Derby, Shelton, Ansonia and Wallingford, Conn., in addition to operating a fleet of motor coaches between Newport, Fall River and Providence. These notes, dated Aug. 1, 1926, and maturing Aug. 1, 1929, were priced at 98½ and accrued interest, to yield about 6.05 per cent.

The Queens Borough Gas & Electric Company, New York, issued refunding mortgage gold bonds, 5 per cent series of 1955, to the amount of $1,500,000, the price being 99½ and accrued interest to yield 5.03 per cent. The proceeds from the sale of these bonds will be used to reimburse the company for additions, extensions and improvements to the properties of the company.

First mortgage thirty-year 6 per cent gold bonds of the Texas Power Corporation, totaling $1,600,000, were offered at 99 and interest yielding about 6.07 per cent, and collateral trust sinking fund 5 per cent gold bonds of the Electrical Securities Corporation, totaling $1,000,000, were offered at 98½ and accrued interest, to yield about 5.10 per cent. The Electrical Securities Corporation owns securities of various public utility companies.

Columbus Electric & Power Amends Charter.—An amendment to the charter of the Columbus Electric & Power Company has just been authorized by the Secretary of State permitting that company to increase its capital stock from $9,750,000 to $11,750,000. The increased capital is to consist of 20,000 shares of preferred stock at a par value of $100 a share. Permission was also granted the company to change 52,500 shares of common stock now issued to 52,500 shares at a par value of $100 and to exchange each of these shares for five shares of common stock without par value.

Republic Railway & Light Reduces Capital.—Stockholders of the Republic Railway & Light Company voted Sept. 23 to decrease the authorized common stock from $7,500,000 (par $100) to $3,750,000 (par $50).

Staten Island Utility Increases Shares.—The Staten Island Edison Corporation, Staten Island, New York, through James T. Taaffe, attorney, Al-

bany, has filed a certificate in the office of the Secretary of State increasing the number of shares of its non-par-value common stock from 200,000 to 280,000.

Pacific Gas Stockholders Vote Change in Set-up.—Stockholders of the Pacific Gas & Electric Company, meeting Oct. 11, voted approval of the new capital set-up outlined in the July 24 issue of the ELECTRICAL WORLD. In accordance with the proposal they (a) reduced the par value of the preferred and common stock from $100 per share to $25 per share, four new shares to be issued in exchange for each outstanding share; (b) voted to eliminate from the present authorized capitalization $100,000 par value of original preferred stock and to increase correspondingly the authorized amount of first preferred stock, and (c) authorized the directors to issue and sell to employees not to exceed $2,500,000 of first preferred 6 per cent stock and $2,500,000 of common stock.

Central Hudson Valley Companies to Merge

Directors and officers of the Central Hudson Gas & Electric Company and the United Hudson Electric Corporation with headquarters at Poughkeepsie have formulated a plan for the consolidation of these two companies and allied organizations, including the Dutchess Light, Heat & Power Company, the Philipstown Electric Corporation, the Kingston Gas & Electric Company, the Ulster Electric Light, Heat & Power Company and the Upper Hudson Electric & Railroad Company. All these companies have been for years under the same management. Their properties are contiguous, and together they form one economic unit which serves the entire central Hudson valley.

To carry out the plan it is proposed that all of the companies indicated shall be consolidated under the laws of the State of New York with an authorized capital of $10,000,000 of preferred stock, divided into shares of the par value of $100 each, entitled to cumulative dividends at the rate of 6 per cent per annum, and with limited voting power; and 700,000 shares of common stock without par value and with full voting power. The preferred stock is to be preferred both as to dividends and assets over the common stock.

On the assumption that all of the holders of the outstanding stocks including stock to be issued under sales heretofore authorized, or to be issued under bond conversions, will join in the consolidation, the stocks of the consolidated company will be distributed as follows, the balance of the authorized amounts being reserved for future needs: Preferred stock: Issued in exchange for preferred stock of Central Hudson Gas & Electric Company, $3,000,000; issued in exchange for preferred stock of United Hudson Electric Corporation, approximately $3,000,000; total, $6,000,000. Common stock: Issued in exchange for common stock of Central Hudson Gas & Electric Company, 187,548 shares; issued in exchange for common stock of United Hudson Electric Corporation, 112,500 shares; total, 300,048 shares.

United Light & Power Adds Property

Gross Income Available for Parent Company Amounted to $10,387,692 Against $4,339,416 for the Previous Year

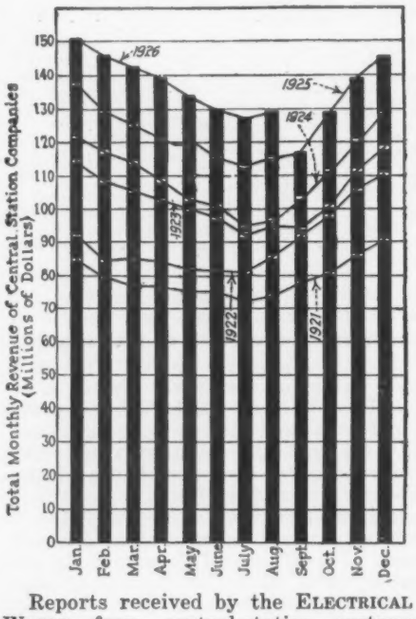
A BARE statement that gross earnings of the United Light & Power have tripled from $11,896,914 in 1924 to $36,742,023 in 1925 would be true but might be misleading. A number of valuable properties were acquired during the year, and gross earnings of all companies now controlled were $33,573,145 in 1924. The gross revenue for last year was nearly one-fifth of the total capital, which is close to the average for companies of this type.

During the year the company acquired control of the Brooklyn Borough Gas Company and the Ohio Utilities Company, and the consolidation of the latter company with the Southern Ohio Electric was effected, operations now being conducted under the name of the United Ohio Electric Company. The Blue River Power Company was also acquired and consolidated with properties of the Nebraska Gas & Electric Company, unifying a superpower system in southeastern Nebraska serving more than a hundred cities and towns in that section. Furthermore, a number of new plants were put into operation during the year.

Out of the gross of $36,742,023, operating expenses and maintenance totaled $18,813,225 and taxes required $2,915,667, or nearly 8 per cent of gross earnings. Earnings of subsidiary companies amounted to $15,012,139, leaving net earnings from all sources of $17,275,735. Interest of $4,337,772 was earned approximately four times. Deductions, including interest on funded debt and prior preferred dividends, took something over $3,000,000, leaving net income of $7,114,586. Class A no-par preferred stock dividends amounted to $887,660 and class B dividends to $324,000. After the deduction of these the surplus available for depreciation, amortization and common stock dividends amounted to $5,902,925, against $1,463,439 from the smaller number of companies during the previous year.

The capital structure of the company is somewhat involved. The total capital stock outstanding is $77,620,820 and the total funded debt in the hands of the public amounts to $130,952,450, making total capital liabilities of $208,573,270. Of this obligations account for approximately 63 per cent, which is higher than the average. The average yearly net earnings during the twelve-year period that ended in 1925 amounted to $4,607,352.

Gross Revenue Totaled $129,200,000 in August



Reports received by the ELECTRICAL WORLD from central-station systems representing 76 per cent of the total generator rating of the industry indicate that the total gross revenue from the sale of energy during the month of August was $129,200,000, an increase of $14,200,000, or 12.3 per cent, over August of last year. The operating and maintenance expenses totaled $61,100,000.

Company Reports

The following statements of earnings have been issued by electric light and power companies for the month of September:

Name of Company	Gross Earnings for September 1926	1925
Alabama Power	$1,104,978	$1,164,540
American Power & Light*	4,686,935	4,050,180
Bangor Hydro-Electric	153,131	137,806
Brazilian Trac., Lt. & Pwr.	3,412,431	2,846,091
Central Illinois Light	326,573	327,701
Central Maine Power	430,318	397,912
Cities Service	1,875,103	1,231,068
Commonwealth Power	4,050,485	3,566,096
Consumers Power	2,023,654	1,697,044
Electric Power & Light	4,144,754	3,919,356
Florida Power & Light	943,498	807,876
Illinois Power	185,790	191,334
Kansas City Power & Light	831,696	786,805
Massachusetts Ltg. Cos.	345,130	319,388
Northern Ohio Power	1,001,809	921,787
Ohio Edison	139,068	113,584
Portland Electric Power	965,215	876,338
Republic Railway & Light	1,025,606	873,515
Southern California Edison	2,516,585	2,250,446
So. Indiana Gas & Elec.	226,034	210,010
Tennessee Electric Power	992,435	934,570
Washington Water Power	457,694	513,964

* August

Dividends Declared

The quarterly dividends listed below have been announced by electric light and power and electrical manufacturing companies:

Name of Company	Per Cent	When Payable
American Superpower, com. A and B	0.30	Dec. 31
American Superp'wr, com. A and B*	.50	Dec. 31
American Superpower, 1st pf.	$1.50	Jan. 3
Associated Gas & Elec., $6 pf.	$1.50	Dec. 1
Associated Gas & Elec., $6½ pf.	$1.62½	Dec. 1
Bangor-Hydro Electric, com.	1¼	Nov. 1
Brazilian Trac., Lt. & Pwr., ordinary	1½	Dec. 1
Cambridge Electric Light	$1	Nov. 1
Cedar Rapids Mfg. & Power	¼	Nov. 15
Central & Southwest Utilities, pr. lin. and pf.	$1.75	Nov. 16
Connecticut Ry. & Ltg., com. and pf.	$1.12½	Nov. 15
Eastern States Power, pf.	$1.75	Nov. 1
Edison Elec. Illum. of Brockton	.62½	Nov. 1
Electric Household Utilities	.50	Oct. 30
Electric Refrigeration, com.	.50	Nov. 20
Electric Refrigeration, com.†	1½	Nov. 20
Georgia Railway & Electric, pf.	1½	Oct. 20
Kentucky Utilities, junior pf.	1½	Nov. 20
Montreal Lt., Ht. & Pwr., Consol.	.50	Nov. 15
Montreal Lt., Ht. & Pwr.	2	Nov. 15
National Power & Light, com.	.20	Dec. 1
Northern New York Utilities, pf.	$1.75	Nov. 1

* Payable in participating preferred.
† Payable in common.

Manufacturing and Markets

Power Factor of Appliance Motors

The Committee Recommends Guarding Against Motors of Low Power Factor or High Starting Current

RAPIDLY growing use of motor-operated household appliances augmented by the use of electric refrigerators and oil burners till the household motor load has become an appreciable factor has caused various central-station companies to consider the effects of such a load on the system power factor. A paper presented last month before the electrical section convention of the Wisconsin Utilities Association by E. S. Schrank, chairman of the power-factor committee, discusses the serious effects of fractional-horsepower motor loads on the system power factor.

To study the ill effects of small motors in residential districts, an investigation was conducted in several of the cities in Wisconsin. In one case the local utility found three cases of severe voltage fluctuations caused by small motors operating intermittently on the lighting circuit. In another Wisconsin city a test was made on five fractional-horsepower motors, two of which were ¼-hp., 110-volt motors connected to washing machines, one a ⅛-hp., 110-volt motor connected to a washing machine, one a ¼-hp., 110-volt motor connected to an electric refrigerator, and one a ½-hp., 110-volt motor connected to a shoe-sewing machine. The results of this test are given in Table I, and emphasize the extremely high current inrush in certain of these motors, and in general, the low power factor when operating.

In still another Wisconsin city a careful study was made of the power factor and the efficiency of a number of small motors under various load conditions. The results of this study are shown in Table II. This latter test was made with particular care and in a well-equipped laboratory. It is noted that the half-load power factor varies from 68.1 per cent down to 32.4 per cent and the full-load power factor from 72.8 per cent down to 45.1 per cent, while the corresponding efficiencies vary from 63.2 per cent down to 30 per cent and from 59.6 per cent down to 36.9 per cent. The apparent efficiencies vary from 42.6 down to 23 per cent, with an average of only 31.6 per cent.

These results conform closely with those found in a similar experiment carried out by Prof. Benjamin F. Bailey of Michigan University for the Detroit Edison Company. In reporting on his experiment Professor Bailey brought out the point that so long as a motor will start and operate a load the user is not particularly interested in its other characteristics, and that too often in the design of these small motors high starting torque is obtained at the sacrifice of power factor and efficiency. For vacuum cleaners, washing machines and similar motorized household equipment, which operate very seldom, such motors are satisfactory and certainly are cheaper in first cost than those having a higher apparent efficiency.

The report points out that Tables I

TABLE I—POWER-FACTOR TESTS ON SMALL SINGLE-PHASE INDUCTION MOTORS

Name Plate	Use	Condition	Volts	Amp.	Watts	P.F. (Calc.)
Motor No. 1: 110 volts, 4.8 amp., 60-cycle, single-phase, ¼-hp., 545 frame.	Washing Machine	Run light	120	5.50	230	34.8
		Belt off	121	5.58	168	24.9
		Run with no washing load	119.5	5.45	260	39.9
		Loaded	119	5.6	330	49.5
Motor No. 2: 110 volts, 4.8 amp., 60-cycle, single-phase, ¼-hp., 545 frame.	Washing machine	Run light	118	4.95	190	32.6
		Run loaded	117	5.05	300	50.8
Motor No. 3: 110 volts, frame 145, 4.2 amp., induction-wound, ¼-hp., 1,725 r.p.m. 60-cycle, single-phase.	Washing machine	Run light	118	4.35	200	38.9
		Run loaded	117	4.60	300	55.7
Motor No. 4: 110 volts, 3.9 amp., single-phase, ¼-hp., 1,725 r.p.m., 60-cycle.	Refrigerator	Belt off	119	3.58	70	16.4
		Normal light	119	3.8	175	38.7
		Loaded	116	4.7	370	67.8
Motor No. 5: ½-hp., 3.5-7 amp., 110/220 volts, type 100 M, 1,725 r.p.m.	Shoe-sewing machine	Run light	120	5.1	233	38.1
		Loaded	118	5.4	320	50.2

TABLE II—POWER-FACTOR AND EFFICIENCY TESTS

Motor	Hp.	P.F. Starting	P.F. No Load	P.F. Half Load	P.F. Full Load	Per Cent Efficiency		Per Cent Apparent Efficiency
						Half Load	Full Load	
Company A: 1	¼	66.6	53.4	68.1	72.7	30.5	36.9	26.8
2	⅛	59.2	28.2	44.8	62.6	40.4	54.9	34.4
3	¼	51.8	24.3	46.4	61.6	45.0	58.7	35.9
4	¼	53.4	25.3	40.0	57.5	47.5	58.5	33.7
5	¼	55.3	37.8	56.2	72.8	39.5	58.4	42.6
6	¼	54.5	25.1	41.6	58.8	42.3	54.7	32.2
Average..		53.5	28.1	46.0	62.55	43.57	58.1	36.3
Company B: 1	¼	54.5	29.4	46.2	60.5	35.7	49.4	29.9
2	¼	50.9	24.7	43.2	59.9	30.0	55.4	33.3
3	¼	52.7	25.1	40.0	56.5	42.5	55.9	31.6
Average..		51.8	24.9	41.6	58.2	36.2	55.6	32.3
Company C: 1	¼	49.4	23.1	42.4	60.0	44.5	59.6	35.7
2	¼	48.6	23.9	48.0	48.4	35.2	50.2	24.3
3	¼	48.8	23.3	38.6	50.0	30.9	46.0	23.0
Average..		48.9	23.4	40.3	52.8	36.8	51.9	27.5
4	¼	46.3	20.9	38.0	3.05	44.4	58.3	30.9
5	¼	46.7	21.8	37.7	51.5	42.1	57.8	29.8
6	¼	46.3	22.2	39.4	52.7	41.1	57.3	30.2
7	¼	45.8	20.5	37.3	50.9	41.7	56.4	28.7
8	¼	42.5	27.3	44.4	58.8	42.1	54.9	32.3
Average..		46.72	22.54	39.36	53.38	42.32	56.94	30.4
9	¼	42.6	23.7	39.3	49.4	40.3	58.6	29.0
Company D: 1	¼	64.6	19.2	40.0	59.5	52.0	60.8	36.2
2	⅛	66.6	24.1	41.0	57.9	48.2	58.2	33.7
Average..		65.6	21.65	40.5	58.7	50.1	59.5	34.9
Company E: 1	¼	50.0	25.7	40.54	72.4	44.2	47.2	34.2
Company F: 1	1/10	68.9	25.1	51.1	63.2	42.6	55.7	35.2
2	⅛	46.9	18.6	32.4	45.1	41.1	55.3	24.9
Company G: 1	¼	43.7	16.7	33.2	51.0	44.7	52.6	26.9
Company H: 1	⅛	48.2	24.1	35.8	50.5	41.4	55.0	27.8

and II indicate the difficulty which power companies will experience to an increasingly greater extent when electric refrigerators and automatic oil burners become more numerous. With a 110-volt, ½-hp. motor, which has a starting current of 29 amp. and an operating power factor of approximately 50 per cent, being used intermittently, satisfactory lighting service may be hard to realize. The recommendation that was made by the committee was to the effect that utility companies guard against the connection of motors of unduly low power factor or high starting current.

Collens Gets McGraw Award

Manufacturers' Medal and Purse Presented at Briarcliff Meeting of Power Apparatus Makers

THE James H. McGraw manufacturers' medal and purse for 1926 was awarded to Clarence L. Collens, president Reliance Electric & Engineering Company of Cleveland, at the fall meeting of the Apparatus Division of the National Electrical Manufacturers' Association, successor of the Electric Power Club, held at Briarcliff Lodge on Oct. 25. The judges appointed by the association to review the field and make the award to the man who in their opinion made the most outstanding contribution to the advancement of the electrical manufacturing industry within the past year were Gerard Swope, president General Electric Company; D. Hayes Murphy, president Wiremold Company, and J. M. Curtin, manager industrial department, Westinghouse Electric & Manufacturing Company.

The citation accompanying the award was as follows:

CLARENCE L. COLLENS, president Reliance Electric & Engineering Company, Cleveland, for years an outstanding advocate of harmony both in standards and

Increased Operations During September

SEPTEMBER witnessed a material increase in the operations of the nation's electrical manufacturing plants taken as a whole. This increased productive activity by this branch of general industry is in line with the operations reported by American industry in general during Sepember. The upward swing during September from the August operations was, however, greater for the electrical manufacturing plants than for industry in general.

Based upon the returns received by the ELECTRICAL WORLD, it is estimated that during September the electrical manufacturing plants of the nation consumed 72,500,000 kw.-hr. of electrical energy as against 65,600,000 kw.-hr. in August, a gain of 10.4 per cent. In spite of this gain in operations by the industry as a whole, some plants reported operations under those of August. Such is the picture of activity in the electrical manufacturing plants of the nation based upon reports received by the ELECTRICAL WORLD on the consumption of electrical energy by a large percentage of the manufacturing companies.

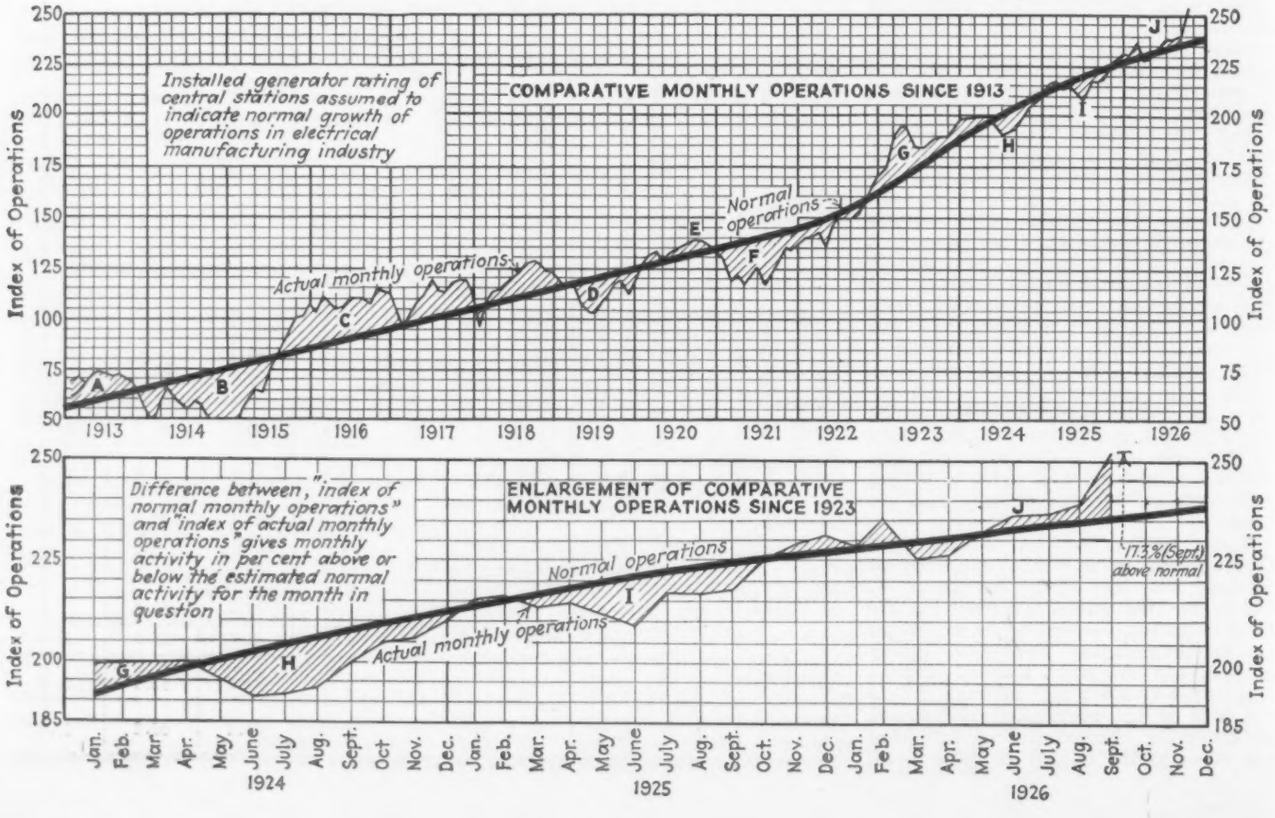
The reports for the month of September indicate that the industry was operating at 17.3 per cent above the estimated normal for that month as against 4.2 per cent above normal during August. Activity in the electrical manufacturing plants since the opening of the year has been slightly above normal with the exception of March and April, when the reports on energy consumption indicated a temporary slump in operations. The operations reported for September are materially above those reported for any previous month of this year. A comparison of the activities during September and August without correction for seasonal variation indicates that actual production activities during September were 10.4 per cent over those of August.

The large increase in activity in the electrical manufacturing plants of the nation during September is emphasized when comparison is made with operations in the other primary industries during the same month. American industry as a whole was operating during September at 2.9 per cent above August and 10 per cent above September of last year.

The rolling mills and iron and steel plants were operating at 5.8 per cent above August, the textile plants 7.2 per cent above August, while the automobile manufacturing plants reported operations 2.5 per cent under those of August. The electrical manufacturing plants, therefore, reported a higher rate of increase over August than other primary industries.

***Electrical World* Barometer of Activity in the Electrical Manufacturing Industry**

(Corrected for seasonal variation and referred to an average monthly normal for the year)



policies within the electrical manufacturing industry and a tireless worker for a closer co-ordination between the associated groups, by the influence of his enthusiasm, energy and sound judgment has carried this ideal and purpose steadily forward and become a recognized leader for co-operation among the electrical manufacturers. As president of the Electric Power Club he was instrumental in effecting a solution of the long-standing controversy over temperature ratings in electric motors and in reconciling this adopted standard with the viewpoint of the National Electric Light Association. More recently realizing the advantages to be gained by an actual union of the separate associations of electrical manufacturers, as chairman of the Electrical Manufacturers' Council he initiated a movement to effect the organization of a single industry association to embrace the membership of the Electrical Manufacturers' Council, the Electric Power Club and the Associated Manufacturers of Electrical Supplies, which he carried to successful consummation in the formation of the National Electrical Manufacturers' Association this fall. In recognition of this constructive contribution to the advancement of the manufacturing branch of the electrical industry the judges have awarded to Mr. Collens the manufacturers' medal and purse given under the James H. McGraw award for 1926.

The presentation was made by Earl E. Whitehorne in behalf of the sponsor committee of awards.

Ironing Machine Makers Organize Association

At a meeting of representatives of leading manufacturers of electric ironing machines held at New York City on Oct. 26 it was voted to form a national association of electric ironer manufacturers. H. G. Grosse, president of the American Ironing Machine Company, was elected president, and C. G. Frantz, president of the Apex Electrical Manufacturing Company, was elected secretary. An executive committee was appointed to formulate future association activities.

Present market opportunities for the ironing machine were discussed, and there were talks by O. H. Caldwell and L. E. Moffatt of *Electrical Merchandising*, C. E. Greenwood, chairman merchandising committee, N.E.L.A.; F. M. Feiker, vice-president Society for Electrical Development, and Earl E. Whitehorne, commercial editor of the ELECTRICAL WORLD.

Business Conditions

THE electrical market continues stable and in good volume. Despite some gloomy predictions for the future, the large majority of electrical manufacturers and utilities look forward to continued good business this fall and next year. Utility budgeting is at a peak, with general increases. Manufacturers are preparing production reports upon the basis of field reports, and in nearly all cases business estimates for next year exceed those of this year.

Normal volume in general buying has been witnessed this week. Somewhat of a slump in the South is offset by increased business in New England and on the Pacific Coast. Industrial activity in New England is evidenced by inquiries and sales, and, in particular, the textile industry reports a change for the better. Diversified lines of electrical switching and construction equipment continue in demand. The intensified drive for appliance sales this year continues to attract a good volume of business in nearly all sections. Good business for the season continues to be reported by those manufacturers having sales in all territories.

Some recession in building is noticed in the East, but in the Middle West and Southwest construction continues at a rapid rate. Inquiries are heavy from power companies in all sections in connection with budget plans.

A Dull Week in the Metal Market

Prices of the non-ferrous metals are a little lower this week and the volume of business in copper, lead and zinc has been small. Only two sellers have participated to any extent in the copper market, inquiries were next to nothing and business has been the result of solicitation supported by price reductions. There have been no sales under 14 cents. On Thursday and Friday of last week the price was 14.05 cents for Connecticut delivery and in the Middle West 14.17 cents. Copper Exporters, Inc., has maintained its foreign price at 14.40 cents c.i.f., and Germany, France, Italy and England have all been in the market, with Germany the leading buyer. There are indications that there is good business behind the domestic market, but consumers are jockeying for the lowest possible price. Producers, however, are not overstocked with metal.

NEW YORK METAL MARKET PRICES

	Oct. 20, 1926 Cents per Pound	Oct. 27, 1926 Cents per Pound
Copper electrolytic	14.15	14.00
Lead, Am. S. & R. price	8.35	8.25
Antimony	14¼	13¼
Nickel, ingot	35	35
Zinc spots	7.65	7.55–7.57½
Tin, Straits	69¾	69¼
Aluminum, 99 per cent.	27	27

Base copper price Oct. 27, 1926, 16¼ cents.

The American Smelting & Refining Company reduced its contract price for New York lead on Oct. 25 from 8.35 cents to 8.25 cents. No reduction was made in the St. Louis market. Sales have been considerably less than last week, though a moderate business is recorded, with shipments equally divided between prompt and November. Foreign demand continues satisfactory.

The week has been dull in the zinc market, with prices slightly lower than Monday. Both galvanizers and brass smelters have bought sparingly, mostly for November delivery. Stocks in the hands of consumers are scant.

Industrial Equipment Attracts Attention in New England

The industrial situation in New England is improving rapidly and is beginning to reflect an encouraging trend in the movement of electrical supplies and equipment in this district. One prominent manufacturer reports inquiries and negotiations from mill areas gradually mounting in volume and predicts that the remainder of the current year will witness more than a normal volume in orders. Motor sales are steady and in good volume; turbo-generator sales are coming along satisfactorily, and orders for two units each of 2,500 kw. capacity were received this week. Small switch and control apparatus and general mill supplies are in good demand, and during the past week equipment for two plants amounting to more than $50,000 was placed. One of the most encouraging aspects of the situation, in the opinion of one manufacturer, is the tendency away from hand-to-mouth buying, a practice which has predominated among textile mills for a number of years. Lately, according to one source, the establishment of larger budgets for supplies and upkeep is an encouraging feature in the electrical market, which promises increased activity this fall as compared with last year.

Industrial electric lighting is active. One central station records much activity in factory lighting. Another is concentrating on store lighting and is busy with many new projects, of which two include store-lighting surveys for fair-sized cities in eastern Massachusetts. Industrial heating is moving along with increasing activity. Household electric appliance sales are gaining, one group of central stations continuing to show increasing volumes of sales for each succeeding week this fall. The general business situation is very gratifying, with the contract volume for the past week for this district recorded at a peak level in excess of all previous years.

Cotton Situation Affects Southeastern Business

Electrical business in the Southeast was slower last week than for many weeks past, owing in a great measure to the drop in price of cotton and to the fact that the larger utility companies are engaged in preparing 1927 budgets and that therefore little activity other than routine business is to be noted. The cotton situation has tended to tighten the money market to some extent, and this is being reflected in business generally, though its volume is still reported satisfactory.

South Georgia continues to be a large purchaser of line-construction materials, one order received this week from that territory being for $7,000 worth of insulators and pole-line hardware. The aggregate of orders from the section generally for poles, pole-line hardware and wire is satisfactory, though no large individual orders have been received of late. Florida is also ordering in reasonable volume distribution transformers, street-lighting equipment, incandescent lamps and poles and wire for storm replacement work, and some housewiring material orders are also reported.

Jobbers report good orders for electrical construction materials from cotton mills in north Georgia, a number of industrial-motor orders ranging from $4,000 to $5,000 each being received from the territory generally. There is some power transformer and substation equipment business pending in the Caro-

linas, and orders on the same are expected to be placed within the next two or three weeks. An intensive power survey of all the Southeastern properties of one of the largest holding companies is under way and will undoubtedly result in considerably increased power loads on the various systems, with the attendant stimulation of power equipment lines.

The demand for heating appliances for holiday stocks is reported strong, with electrical toys already beginning to move. Range sales are holding up well, and several campaigns are under way over the territory, particularly in Florida. Campaigns on commercial and industrial lighting equipment during the next two months will stimulate considerably the sales of this equipment in the territory.

Middle West Market Shows Good Volume

Indications from all points of the Middle West are that business is continuing its recent rate of speed. No recession in building activity is evident. In the Chicago district it is about 20 per cent ahead of the same period last year. The volume of electrical business is very satisfactory, and general optimism is manifested throughout the entire section. The various utility companies are busy extending their lines, and while no notably large orders for apparatus were placed this week, maintenance purchases are in good volume, with the total volume of sales to the power industry assuming sizable proportions, one company's purchases averaging $105,000 per day. Among the interesting orders placed this week were seven carloads of copper busbar, 20,000 pin-type porcelain insulators and an order for truck-type disconnecting switches valued at $75,000. There has been a good demand for pole-line hardware, weatherproof wire and meters.

Jobbers generally report good business. Appliances are moving readily, with a good demand for toasters and heaters. Washing machines are moving well, one jobber placing a single order for 750 machines this week. There has been a healthy demand for code wire, prior to an advance in price, with a steady demand for conduit and wiring devices. Prices remain generally firm.

In the St. Louis district there is no change from last week. As to the year's business, one prominent jobber states that only one item among a large number of lines handled will fall below last year's business for the ten months elapsed. At the present time the large operating companies are sending out inquiries for the various items of construction and equipment required for their next year's budget. The quantities mentioned in their memoranda indicate quite extensive programs of expansion for 1927. One of the largest Portland-cement companies has just placed an order for motors and accessories aggregating around $10,000. One of the lead-mining companies in the district adjacent to St. Louis placed an order for a 4,000-kw. turbo-generator last week. This is the second unit of approximately this size sold to the lead mines in the past month.

Power-Company Activity Revives on Coast

Power-company inquiries have characterized the past week on the Pacific Coast. This is a class of business that has been dormant for several weeks. Activity in poles is particularly noticeable, and inquiries for one carload each of 20-ft., 30-ft., 40-ft. and 55-ft. poles, three carloads of 8-in.-top, 45-ft. poles and two carloads of 10-in.-top, 60-ft. are reported. Porcelain insulators are also in good demand, there being inquiries for one carload each of clevis and loop-and-hook types and also for miscellaneous 30-kw. types, aggregating $2,500. Miscellaneous power inquiries concern 30,000 assorted bolts complete with washers, three special time switches for a 3,300-volt circuit and 20,000 fuse plugs. Railroad orders include 5,000 guy clamps and 5,000 dry batteries. Export orders are featured by 1,000,000 ft. of No. 17 single-drop wire and 600,000 ft. of paired telephone wire, all for 1927 shipment to the Philippines. Dealers report an excellent business in radio accessories, especially chargers and batteries. Some recent broadcast innovations in symphony and operatic music have given a marked impetus to sales of receiving sets. Contractors' and industrial orders have included 2,000 toggle switches and 1,500 convenience outlets complete with bakelite plates, 1,000 heavy-duty heater switches, 1,000 stand-lamp clusters and 3,000 lb. of No. 6 bare copper wire, the last being for a lumber company. Prices are steadier, switch and conduit boxes having advanced 10 per cent and No. 14 single solid-rubber-covered wire 3 per cent, with further advances predicted. The outstanding power apparatus order covers one steam turbine rated at 3,000 kw. and 2,300 volts for a Hawaiian Island sugar plantation, complete with incidentals. This order totals $75,000. Other machinery orders include miscellaneous motors, a motor-generator set and a transformer worth $25,000 for a pulp and paper mill. Eighty sets of ½-hp. and ¾-hp. motor parts were bought by a manufacturer of oil-burner equipment.

Improved Buying for Central Stations in New York

Central-station buying in the New York district is improving, except that the demand for generating apparatus is still dull. Transformer sales, too, are slow, but an increase is apparent in the inquiries received for quotations on this apparatus. Switching equipments are in fair demand, a good volume of small individual orders and inquiries being reported by manufacturers. A brisk demand for pole-line hardware is reported, including some substantial sales to holding companies to replace damaged installations in Florida. Some sales are also reported to holding companies for short-line extensions in the Middle Atlantic and New England States. Poles and cross-arms are strong, although individual orders are limited to one or two carloads. Industrial buying of motors is steady, with a slight increase in the demand for motors of from 10 hp. to 50 hp. Control apparatus is stronger than last week, but is still quiet. Jobbers' lines are steady, and an increase in the movement of appliances is reported.

Activities of the Trade

Link-Belt Company Moves Boston Office

The Boston office of the Link-Belt Company, formerly at 49 Federal Street, will be moved on Nov. 1 to 1103-1104 Statler Building, in the center of the Back Bay district and close to the Back Bay station. The removal has been necessitated by a steadily increasing growth of business.

Frigidaire Corporation's Factory Extension Nearly Finished

The Frigidaire Corporation's twenty-million-dollar factory expansion project is nearing completion in Dayton, Ohio, a large number of the new buildings being under roof, and machinery is being installed. It will be placed in production early in 1927. When completed the company will have 53 acres of factory space devoted to manufacture of electric refrigeration units, with a capacity of 50,000 units a month.

For the second time within a period of three months the Frigidaire Corporation announces a price reduction in its ice-cream cabinet line. Frigidaire ice-cream cabinets were cut when a general price reduction affecting both the household and commercial Frigidaire lines was announced in August. The second price reduction, which is very substantial, was made Oct. 6, simultaneously with the opening of the dairy products and ice-cream manufacturers' show at Detroit. At this show the corporation exhibited for the first time an electrically refrigerated ice-cream delivery truck, the first step the Frigidaire Corporation has made in the field of electrically refrigerated transportation. The current used is supplied by a Delco-Light electric plant.

American Jobbers' Supply Builds New Cross-Arm Factory

A new cross-arm factory and general warehouse has just been constructed by the American Jobbers' Supply Company, 1502 Woolworth Building, New York, at Ninth and Chesapeake Avenues, Baltimore. The buildings are on a tract over two acres in extent, and the company has constructed its own railroad siding between the two warehouses. The making of cross-arms in the new plant has just been started. The company asserts that much of the business for finished cross-arms which was formerly placed with Pacific Coast mills will now be placed at the Baltimore factory. The lumber used will be shipped by boat from the Pacific Coast.

The Pittsburgh Reflector Company, Pittsburgh, has appointed Lyman D. Morgan manager of the Northern Pacific section, with offices at 240 Securities Building, Seattle. Mr. Morgan recently returned from Philadelphia, where he assisted in the design and installation of electrical lighting effects at the Sesquicentennial Exposition.

The Texlite Electric Sign Company, Dallas, Tex., will lease a factory building to be constructed on East Commerce Street, between Ashland and Parry Avenues, and will establish a new plant there. It will be one-story, 135 ft. x 150 ft., with extension 31 ft. x 35 ft., and is estimated to cost close to $60,000 with equipment.

The Roto Company, Hartford, Conn., manufacturer of electrically operated boiler-tube cleaners, etc., is perfecting plans for the early occupancy of a new plant at Newark Street and Sussex Avenue, Newark, N. J., recently leased. The building is two-story, 100 ft. x 100 ft., and will be remodeled and improved. The company will remove a portion of its equipment from its present plant at Hartford to the new location and install additional machinery.

The General Electric Company has just completed the building of a storage-battery locomotive weighing 110 tons and capable of hauling a 1,500-ton train equivalent to 70 empty or 30 loaded freight cars at a speed of from 8 to 10 miles an hour. This locomotive is now in service in Chicago.

The General Necessities Corporation, Detroit, owner of the Absopure Company, manufacturer of electrical refrigerators, has announced purchase of the capital stock, plant, etc., of the Vogt Refrigerator Company, 618 Barret Avenue, Louisville, and plans to enlarge the Louisville plant in order to insure large production of the Vogt refrigerator.

The Graybar Electric Company has shipped one of the largest lighting unit orders of its kind by express to the Florida Power & Light Company, at Miami, Fla., for reconstruction purposes. The order consists of 1,000 "Novalux" center-span fixtures, with cross-arm suspension and radial wave reflectors.

The Westinghouse Electric & Manufacturing Company has awarded a building contract for its four-story factory branch and distributing plant on Trumbull Street, near Stanley Street, Detroit.

The National Carbon Company, Inc., Cleveland, has prepared a motion picture, entitled "Behind the Pyramids," which shows in a very interesting manner the manufacture, application, operation and care of carbon brushes and other carbon products used in the electrical industry. This picture will be shown before technical society meetings, operating department groups, engineering college classes, etc.

The American Steel & Wire Company, 208 South La Salle Street, Chicago, announces that since Oct. 4 its Birmingham (Ala.) office has been greatly enlarged and made a center of sales operations for the district and has been made a unit of the general sales office in Chicago. J. J. Gilmore, formerly in charge of the office, has been promoted to be manager of sales. From this office, which is in the Brown-Marx Building, Alabama, Mississippi and Louisiana are covered.

The Fitzgerald Manufacturing Company, Torrington, Conn., announces that it has placed on the market a new standard 6-lb. electric flatiron known as the "Star-Rite."

The Cutter Company, Philadelphia, manufacturer of circuit breakers, has published a book entitled "Experience Is Master," in which it describes the company's organization and policy. Photographs of those men who have served the Cutter organization and its customers for ten years or more are included. Who these men are and the nature of their duties are explained.

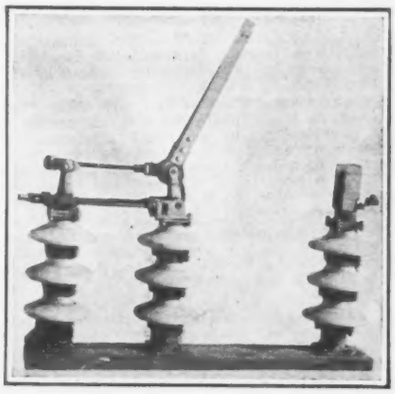
The Westinghouse Electric & Manufacturing Company announces that T. C. Randall has been appointed street lighting engineer in the Buffalo territory.

The Bridgeport Brass Company, Bridgeport, Conn., announces that J. R. Brandt has joined the Cleveland office, at 2017 Superior Viaduct, as raw-material salesman in the Pittsburgh territory and parts of Ohio.

New Equipment Available

Disconnecting Switch

A new line of gang-operated manually controlled or motor-controlled disconnecting switches has been developed by the Delta-Star Electric Company, Chicago. One element of the three-pole switch is shown in the illustration, the other poles being mechanically interlocked by means of standard iron pipe. Either petticoat or flange-type



GANG-OPERATED DISCONNECTING SWITCH OF THE DOUBLE-ACTION TYPE AVAILABLE IN A VOLTAGE RANGE FROM 33 KV. TO 110 KV.

insulators can be used, and this construction permits the assembly of the switch for any voltage from 33 kv. to 110 kv. The blade is of the double-action type, the first opening moving the blade in a horizontal plane, and after clearing the contact it is then raised vertically.

Self-Starting Squirrel-Cage Motor

A new type of Hanson-Oesterlein self-starting squirrel-cage motor, having a single-rotor winding with the rotor bars near the surface, thus insuring minimum magnetic leakage, has been developed by the Northwestern Manufacturing Company, Milwaukee. The rotor bars are connected on the end with low-resistance arc-welded copper end rings. These are partly surrounded by steel laminations. A separate magnetic circuit thus controls the starting characteristics of the motor and is entirely independent of the rotor and stator fields. For motors requiring a high starting torque high-resistance end rings are placed next to the rotor cove. During the starting period the high impedance in the low-resistance end rings prevents the flow of current in them and forces it through the high-resistance end rings, producing a high starting torque. As the speed increases the impedance in the low-resistance end rings decreases and the total torque increases until the rotor reaches full speed.

These motors, known as the type H-O, are regularly built for two torque ratings, one having 130 per cent starting torque and the other 200 per cent starting torque. The company states that the efficiency of these motors is high and is the same as its standard type H motor, but the power factor is slightly less.

New Line of Double-Control Panels

A new General Electric line of double-control panels is designed to govern motors driving house, sprinkler, sump and circulating pumps in hotels, office buildings, large apartment houses, etc. Each panel consists of a composition base supported on angle-iron frames for floor mounting. When the panel is used to control one motor, it usually contains one fused line switch, two starters, one test switch for each magnetic starter and one transfer switch. For the control of two motors another line switch is added. Undervoltage release and overload protection are furnished for each starter. When controlling one motor, the transfer switch allows the transfer of the motor from one starter to the other. When controlling two motors, either motor may be transferred to either starter. The new line of double panels covers both alternating and direct current.

Boiler-Gage Light. — A boiler-gage light, consisting of a tubular reflector with a bayonet attachment to the socket flange, has been placed on the market by the Westinghouse Electric & Manufacturing Company. A compression spring serves to maintain the connection and to hold the lamp in place, so that neither the reflector nor the lamp can loosen under vibration.

New Trade Publications

TURBINES. — The Standard Turbine Corporation, Scio, N. Y., is distributing bulletin No. 13, covering its steam turbines for pumps, fans and other applications. It contains illustrations of various types of the turbine and a drawing showing a section through a standard-frame D turbine.

FRICTION AND INSULATING TAPES. —A booklet issued by the United States Rubber Company, 1,790 Broadway, New York City, describes its friction and insulating tapes. A partial list of mechanical rubber products manufactured by the company is included.

ELECTRIC TRUCKS.—A series of new booklets have been issued by the Commercial Truck Company, 300 Hunting Park Avenue, Philadelphia, calling attention to the advantages of the use of electric trucks in the bakery, department-store, ice-cream, laundry and milk industries.

AIR FILTERS. — Bulletin No. 2,223 issued by the American Blower Company, Detroit, describes and illustrates the "Sirocco" air filter for ventilation and air purification in telephone exchanges, transformers, generators, schools, theaters, factories, etc., and for dust removal in enameling and painting rooms, gas and oil engines, air compressors, etc.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Puerto Varas, Chile (No. 22,629), for self-contained lighting outfits.

An agency is desired in Puerto Varas, Chile (No. 22,629), for radio tube sets.

An agency is desired in Goerlitz, Germany (No. 22,656), for electrical hotel and restaurant equipment.

Purchase is desired in Leipzig, Germany (No. 22,673), of wiring material, such as switches, conduits, and fuses.

Purchase is desired in Leipzig, Germany (No. 22,673), of electrical household appliances, especially novelties.

An agency is desired in Belfast, Ireland (No. 22,674), for electrical equipment for automobiles.

An agency is desired in Belfast, Ireland (No. 22,674), for novelty electric lamps.

An agency is desired in Belfast, Ireland (No. 22,674), for electric lighting fixtures.

An agency is desired in Melbourne, Australia (No. 22,675), for electric household appliances.

An agency is desired in Melbourne, Australia (No. 22,676), for window advertising flash electric signs.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

MANCHESTER, N. H.—The Public Service Company of New Hampshire, Inc., recently organized to take over the Manchester Traction Light & Power Company, Keene Gas & Electric Company and other utilities in this section, contemplates extensions in transmission lines in the vicinity of Manchester, Laconia and Milford.

INDIAN ORCHARD, MASS.—The Chapman Valve Manufacturing Company plans to install electric power equipment in its proposed plant addition, to cost about $500,000.

WHITMAN, MASS.—The installation of an improved street-lighting system in the business district is under consideration.

Middle Atlantic States

BLOOMING GROVE, N. Y.—Permission has been granted the Orange & Rockland Electric Company, Monroe, for the transfer of an electric franchise granted the Central Hudson Gas & Electric Company by the local Town Board to supply electric service here. The Public Service Commission has also authorized the Orange & Rockland company to construct an electric plant in the town.

BUFFALO, N. Y.—Preliminary plans are under advisement for improvements in the lighting system in the Fernhill section. The St. Clements Community Mens Club is at the head of the project.

GEORGETOWN, N. Y.—Permission has been granted the New York State Gas & Electric Company, Ithaca, to extend its electric system in Georgetown, and also approval of the franchise granted by the town.

ILION, N. Y.—The village officials have applied to the Public Service Commission for authority to extend the transmission lines of the municipal electric light plant into the town of Frankfort to supply electricity in a lighting district to be created there.

MASPETH, L. I., N. Y.—The Sterling Casket Hardware Company, 383 Kent Avenue, Brooklyn, will install electric power equipment at its proposed one-story plant on Grand Avenue, estimated to cost $110,000. Harry Harvie, 370 Seventh Avenue, New York, is architect.

MINETTO, N. Y.—Steps have been taken by C. P. Stevens and John Barrett for the installation of a street-lighting system in the village.

NEW YORK, N. Y.—Bids will soon be asked by the New York Edison Company, for an addition to its six-story office, service and operating building, 50 ft. x 100 ft., at 177th Street and Monterey Avenue, reported to cost more than $75,000. William Whitehill, 709 Sixth Avenue, is architect.

ROCHESTER, N. Y.—Extensions are contemplated by the Rochester Gas & Electric Company to its station No. 5, located at the Lower Falls of the Genesee River, to cost about $1,100,000. The work will include an extension to the power station and the installation of a 20,000-hp. turbine, etc.

SAG HARBOR, N. Y.—The installation of additional street lamps throughout the village early in 1927 is under consideration by the Board of Village Trustees.

SYRACUSE, N. Y.—The Syracuse has applied to the Public Service Commission for permission to exercise a franchise granted by the town of Cazenovia for the erection of a high-tension transmission line through a portion of the town to reach the property of the Rock Cut Stone Company.

CAMDEN, N. J.—The installation of an improved lighting system on Mount Ephraim Avenue, is under consideration by the Mount Ephraim Business Mens' Association. 1559 Mount Ephraim Avenue.

KEYPORT, N. J.—Extensions and improvements are contemplated to the waterworks pumping station, including the installation of new pumping machinery.

FAWN GROVE, PA.—The Glen Rock (Pa.) Electric Company, is negotiating for the purchase of the plant of the Fawn Light & Power Company. If taken over the company plans expansion in this district, including extension of transmission lines.

FRANKLIN, PA.—The Chicago Pneumatic Tool Company, 6 East Forty-fourth Street, New York, plans to install electric power equipment in its proposed new plant unit, for the production of Diesel engines, to cost about $350,000.

MEYERSDALE, PA.—The Penn Public Service Company, Johnstown, which recently acquired the properties of the Meyersdale Electric Light, Heat & Power Company, contemplates extensions in its transmission line to Meyersdale and vicinity from the present terminus about 5 miles from the city.

PARKESBURG, PA.—The Pennsylvania Railroad Company, Philadelphia, Pa., is said to be planning the electrification of its line. The company is also considering the electrification of its system in the vicinity of Paoli and Lancaster.

PHILADELPHIA, PA.—The Baltimore & Ohio Railroad Company, Baltimore, is planning the electrification of part of its lines in the Philadelphia city limits to cost about $15,000,000. Of this amount about $5,000,000 will be used for a new passenger terminal at Twenty-fourth Street, with power house, pumping stations, etc.

PHILADELPHIA, PA.—The Department of City Transit has plans for a one-story and basement power substation at Park Avenue and Cumberland Street, to cost about $65,000.

PHILADELPHIA, PA. — The Reading Company, Reading Terminal, operating the Philadelphia & Reading Railway, is said to be planning the construction of a one-story power substation at 1117 Arch Street.

ROCK HILL, PA.—The Rock Hill Light & Power Company, recently chartered under state laws, is reported to be considering extensions in transmission lines, to include a number of neighboring communities.

WORMLEYSBURG, PA.—The installation of additional street lamps in the borough is under consideration by the Borough Council.

ROMNEY, W. VA -The Potomac Valley Power Corporation, recently organized by officials of the Atlantic Public Utilities, Inc., 70 State Street, Boston, to take over the properties of the Romney Electric Company and other utilities in this section. Plans, it is said, are under way for extensions in transmission lines, and rebuilding part of the present system.

WASHINGTON, D. C.—Bids are being asked by the Bureau of Yards and Docks, Navy Department, Washington, (no closing date stipulated) for one 150-kw., engine-driven direct-current generator for the local naval hospital, installed on foundation provided by the government (Specification 5293).

North Central States

DETROIT, MICH.—Plans are being prepared by Smith, Hinchman & Grylle, 800 Marquette Building, engineers, for the construction of an exchange building on Coon Avenue for the Michigan Bell Telephone Company, to cost about $750,000.

EAST LIVERPOOL, OHIO.—The City Council has authorized a ten-year lighting contract with the Ohio Power Company, which proposes extensions and betterments, including transmission line construction.

YOUNGSTOWN, OHIO.—The Trumbull Steel Company plans the installation of electric power equipment in connection proposed extensions and improvements in its local mills, to cost $1,500,000.

LOUISVILLE, KY.—The Federal Flourspar Company, 312 South Sixth Street, is reported to be planning the construction of a power plant in connection with grinding mill at its Flourspar properties.

LOUISVILLE, KY. — Electric power equipment will be installed in the proposed additions to be made in the local plant of the Vogt Refrigerator Company, which has been acquired by the General Necessities Company, Detroit. The cost of the work is estimated at $500,000.

MANNINGTON, KY.—The Mannington Fuel Company plans to install electric power equipment at its plant, including motor-generator set and auxiliaries.

NEWBURGH, IND.—The United States Engineer Office, Louisville, Ky., has preliminary plans under way for the construction of a power plant at the Ohio River Dam No. 47, Newburgh, estimated to cost $35,000. Bids will soon be asked.

CHICAGO, ILL.—The International Harvester Company, 606 South Michigan Avenue, is planning to build an extension to its power house, to cost about $30,000.

PANA, ILL.—Arrangements are being made by the Central Illinois Public Service Company, Springfield, for the installation of a new street-lighting system in the downtown section. The plans provide for seventy-five standards, mounted with lamps of 250 cp.

WATERTOWN, ILL.—Plans are being prepared by the State Architectural Department, Springfield, for a new power house at the Watertown State Hospital, to cost about $200,000.

GREEN BAY, WIS.—Plans have been adopted by the Wisconsin Public Service Corporation to extend its transmission line from Valmy to Jacksonport, thence west to Peninsular Center. Here the line will be divided, one branch continuing west to Egg Harbor and the other leading to Baileys Harbor. The total mileage of the new extension will be 23½ miles. Upon completion of these extensions the corporation will take up the question of building an extension from Egg Harbor to the towns of Fish Creek and Ephraim.

MADISON, WIS.—The Common Council is considering a petition requesting the installation of an ornamental street lighting system on University Avenue from Gilman to State Street.

MILWAUKEE, WIS.—The Charles A. Krause Milling Company plans to install electrically operated machinery in its proposed new plant, to cost about $250,000.

RACINE, WIS.—Steps have been taken by the West Racine Business Men's Association for the installation of an improved lighting system in the business section of West Racine.

RIPON, Wis.—The Wisconsin Power & Light Company is completing arrangements for the construction of a power line between Poy Sippi and Winneconne. This line will be 11,400 volts and will extend 17 miles.

SHEBOYGAN, WIS.—Bids are being advertised by the city of Sheboygan on a new ornamental street lighting system on North Third st. boulevard.

STOUGHTON, WIS.—Plans for the rebuilding and reconditioning of the Dunkirk hydro-electric plant are under consideration by the City Council.

HIBBING, MINN.—The Minnesota Power & Light Company has plans under way for the construction of a transmission line from Nashwauk to this place, to operate at 110,000 volts. It is also proposed to make improvements in substations at Nashwauk, including installation of additional equipment.

BURLINGTON, IOWA.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 17 for conduit and wiring and lighting fixtures at the United States post office, Burlington. For details see Searchlight section.

SHELDON, IOWA.—The Iowa Light, Heat & Power Company, Carroll, is planning for extensions and improvements in its local power plant; also in transmission lines to Archer, Hospers, Royden and vicinity. The entire program will cost about $65,000.

SIBLEY, IOWA.—The City Council is considering extensions and betterments in the municipal electric light and power plant to cost about $56,000, including additional equipment.

BRANSON, MO.—The Taney Light & Water Company has secured a renewal of its franchise with the city for a period of twenty years and is reported planning improvements in system, including street lighting.

ST. LOUIS, MO.—Plans are being prepared by the Southwestern Bell Telephone Company for an addition to its telephone exchange building at Eleventh and Oak Streets, to cost about $600,000. Holt, Price & Barnes, 800 Davidson Building, are architects.

MAYVILLE, N. D.—The City Council has approved plans for the immediate installation of an ornamental lighting system in the downtown district, with underground cable installation.

WHITE RIVER, S. D.—The village of White River has applied to the Federal Power Commission for a license covering a 115-hp. project on Little White River.

FAIRBURY, NEB.—Plans are being considered by the City Council for extensions and improvements in the municipal electric lighting plant and waterworks.

GIBBON, NEB.—The Central Power Company, Grand Island, is reported to be planning for extensions in its transmission line for commercial light and power service.

MEDICINE LODGE, KAN.—The City Council will soon ask bids for the installation of an ornamental lighting system on two main streets in the business section.

TOPEKA, KAN.—The Board of Trustees, St. Mary's College, has preliminary plans under consideration for a power plant, estimated to cost $50,000. The S. A. Sulentic Consulting Engineering Company, New England Building, Kansas City, Mo., is consulting engineer.

Southern States

ASHEVILLE, N. C.—The Board of City Commissioners is disposing of a bond issue of $44,000, the fund to be used for extensions and improvements in the lighting system.

COLERAIN, N. C.—The towns of Colerain and Harrellsville are considering erecting a transmission line to Ahoskie, a distance of about 20 miles, and installing a lighting system.

TRYON, N. C.—The General Gas & Electric Company, New York, N. Y., is reported to be planning for extensions in transmission lines. The company recently acquired the Melrose Power & Manufacturing Company.

MACON, GA.—The installation of new pumping equipment at the municipal waterworks, to cost about $50,000, is under consideration by the City Council.

VILLA RICA, GA.—The Georgia Railway & Power Company, Atlanta, has acquired the local plant and system of the Villa Rica Electric Light & Power Company, and contemplates extensions and improvements, including transmission line construction.

WAYCROSS, GA.—The Ware County Light & Power Company contemplates extensions in its transmisison line on Carswell Avenue.

BILOXI, MISS.—The installation of an ornamental lighting system in under consideration by the City Council.

BROOKHAVEN, MISS.—The Mississippi Power & Light Company, Jackson, which is negotiating for the purchase of the municipal electric plant, plans to erect a transmission line for local service.

DREW, MISS.—The Mississippi Power & Light Company, Jackson, is said to be planning extensions in its transmission line. The company has recently acquired the municipal lighting plant.

McCOMB, MISS.—The Mississippi Power Company, Gulfport, which owns the local system, contemplates rebuilding the electric lines in East and West McComb.

NEW ORLEANS, LA.—The New Orleans Public Service, Inc., has filed plans for the construction of a two-story service and mechanical works at Perdido and Magnolia Streets, including meter shop, machine repair shop, jobbing department, etc., estimated to cost $50,000.

WELEETKA, OKLA.—The Oklahoma Power Company, Okmulgee, has started work on the construction of a new generating station on the Canadian River at Weleetka, with an initial generating capacity of 15,000 kw. The new plant will serve a group of communities in the vicinity of Okmulgee and Henryetta.

BROWNSVILLE, TEX.—The Valley Electric & Ice Company, San Benito, is negotiating for the purchase of the municipal electric light plant. If taken over the local system will be connected with the transmission system of the company.

BURNET, TEX.—The Texas Power & Light Company, Waco is considering the erection of a high-tension transmission line from Burnet to Lampasas, and to erect a substation at Post Mountain.

COMMERCE, TEX.—Plans are being prepared by the Louisiana Ice & Security Building, St. Louis, for a local ice manufacturing plant with an initial capacity of 35 tons per day. George E. Wells, Security Building, is engineer.

DENTON, TEX.—Extensions to the municipal electric plant are under consideration, including the installation of a 350-hp. gas engine.

ELGIN, TEX.—The erection of a high-tension transmission line between Elgin and Manor is under consideration by the Texas Public Utilities Company, Dallas.

HOUSTON, TEX.—A contract has been awarded by the Myers-Spalti Manufacturing Company 2115 Runnels Street, for the erection of an addition to its factory building, to cost about $40,000, to be utilized as a machine shop and power house.

SAN ANTONIO, TEX.—At an election to be held Nov. 15 the proposal to issue $75,000 for the installation of a refrigerating plant in the municipal auditorium will be submitted to the voters. I. Ewig is city engineer.

Pacific and Mountain States

ABERDEEN, WASH.—In connection with a budget for municipal improvements for 1927, the City Council has approved an appropriation of $2,000,000, for the construction of its proposed municipal hydro-electric power plant, for which plans will soon be consummated.

SPOKANE, WASH.—The Washington Water Power Company has filed plans for the construction of a one-story substation at Twenty-fifth and Arthur Streets.

BEND, ORE.—The Arnold Irrigation Company contemplates the construction of a power plant in connection with a proposed irrigation system in the Arnold Crane Prairie District, using the west fork of the Deschutes River as source of supply. The project will cost $200,000. Application for permission has been made.

GOLD HILL, ORE.—Plans are being prepared by the Beaver Portland Cement Company, for the construction of a hydro-electric plant for service at its mill, to cost about $150,000. Floyd W. Allen, Railway Exchange Building, Portland, is engineer. Owing to a typographical error this item was published under Gold Mill, instead of Gold Hill, in the issue of Oct. 16.

CALEXICO, CAL.—A proposition is under consideration for the installation of an ornamental lighting system in the downtown district. The Chamber of Commerce is at the head of the project.

GLENDALE, CAL.—The City Council has adopted a resolution providing for the installation of an ornamental lighting system on portion of Geneva Street.

LOMPAC, CAL.—The Puritan Ice Company plans the installation of electric power equipment in its proposed ice-manufacturing plant on local site, to cost approximately $150,000.

LOS ANGELES, CAL.—The American Laundry Machine Company plans the installation of electric power equipment in its proposed three-story plant at Fourth and Anderson Streets, to cost approximately $100,000, with machinery. Headquarters of the company are at Cincinnati, Ohio.

LOS ANGELES, CAL.—At a recent special election the voters approved the proposal to issue $21,000,000 in bonds for extensions to the municipal electric and water facilities. Of this amount $11,000,000 will be used to carry out three major expansion programs: (1) Development of 28,000 hp. additional hydro-electric energy along the Owens River aqueduct; (2) acquisition of rights-of-way and the construction of tower lines and two new electric stations as a part of a high-voltage transmission system which will ultimately circle the city; (3) Purchase of privately owned electric distribution lines in recently annexed districts.

PASADENA, CAL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until Nov. 9 for the installation of one full magnet control electric freight elevator in the United States post office, Pasadena. For details see Searchlight Section.

SAN DIEGO, CAL.—The City Council has adopted a resolution providing for the installation of an ornamental lighting system on a portion of Adams Avenue, using pressed-steel standards.

SAN JOSE, CAL.—The City Council has plans in progress for the installation of an ornamental lighting system on North First Street, between Rosa Street and the line of the Southern Pacific Railroad. William Popp is city engineer.

MALAD, IDAHO.—The installation of a new street-lighting system is under consideration by the town officials.

CEDAR CITY, UTAH.—The Dixie Power Company contemplates building a supplementary hydro-electric plant on the Santa Clara River, below its present No. 2 station, to develop 800 kw. The cost is estimated at $200,000.

MURRAY, UTAH.—The installation of a new ornamental lighting system is under consideration by the Town Council. The plans provide for fifty-four standards.

OGDEN, UTAH—The City Council is considering a petition for the installation of an ornamental lighting system on Washington Avenue from Twenty-second to Twenty-sixth Streets, and adjoining important thoroughfares.

REDSTONE, MONT.—The Montana Power Company, Butte, is reported to be arranging for extensions in transmission lines from Plentywood to Redstone, Midbey, Archer, Flaxville terminating at Opheim, Mont., for commercial light and power service. At a later date, the company purposes to construct a transmission line from Glendive to Fairview.

SCOBEY, MONT.—The Montana-Dakota Electric Company has plans for the construction of a transmission line to this vicinity.

Canada

CALGARY, ALTA.—The City Council has plans for the immediate construction of a one-story municipal electric lighting plant, reported to cost about $15,000.

WINNIPEG, MAN.—Alterations in the original plans for extensions of the Hydro system in the Southern Manitoba have been decided upon by the Provincial Hydro Commission, which will reduce the original expenditure from $250,000 to about $150,000. Tenders for the proposed work will be called during the winter months.

SHERBROOKE, QUE.—The City Council plans to develop the Westbury power site at a cost of about $500,000. The project will include the construction of a dam and power station.

Electrical Patents

Announced by U. S. Patent Office

(Issued Sept. 28, 1926)

1,601,330. SPEED REGULATOR SYSTEM; S. A. Staege, Pittsburgh, Pa. App. filed Feb. 19, 1921. Adapted to maintain a substantially constant-speed ratio between a plurality of movable members.

1,601,331. CROSSING FOR TROLLEY CONDUCTORS; P. G. Swars, Pittsburgh, Pa. App. filed Oct. 29, 1925.

1,601,336. CONTROLLER; B. O. Austin, Wilkinsburg, Pa. App. filed May 10, 1922. For governing remotely-controlled switches. A device for opening a circuit that governs a line switch, upon a slight reverse movement of a controller drum.

1,601,341. REGULATOR SYSTEM; C. E. Braun, Camas, Wash. App. filed June 10, 1922. Load-regulating system.

1,601,346. LIMIT SWITCH; T. J. Callahan, Dayton, O. App. filed Feb. 25, 1924.

1,601,358. SPECTRUM LAMP; T. P. Hall, Vancouver, B. C. App. filed March 31, 1925. For therapeutic use.

1,601,363. APPATATUS FOR TESTING INDUCTIVE TRAIN CONTROL DEVICES; W. K. Howe, Rochester, N. Y. App. filed March 4, 1922.

1,601,380. CIRCUIT BRAKING DEVICE; E. B. Swerdfeger, Denver, Colo. App. filed May 10, 1924. A fluid operated circuit breaker. A switch primarily intended for use in connection with fluid cooled electrical apparatus in which it is essential that an electric circuit should be broken in the event of any disarrangement of the fluid cooling circulation system to prevent damage to the apparatus by reason of the undue heating of the same.

1,601,383. LIQUID TESTING APPARATUS; E. W. Todd, Mitchell, Neb. App. filed June 23, 1925. For testing liquids for acidity or alkalinity.

1,601,410. PHASE AND FREQUENCY CONVERTER; B. Nordfeldt, Blasbo, Vasteras, Sweden. App. filed Jan. 11, 1923. The conversion of polyphase current into single phase, and having an arrangement which simultaneously changes the frequency of said current. The invention is based upon the principle of connecting together two voltage polygons, for instance voltage triangles, at two points, while the phase sequence of the polygons is such that in a vector diagram they will lie opposite to one another. According to the invention, such voltage polygons or other analogous thereto, are obtained from windings arranged on one machine or on mechanically connected machines.

1,601,457. DRY CELL AND DEPOLARIZING COMPOSITION THEREFOR; E. C. Smith, Fremont, O. App. filed Dec. 30, 1922. Using regulated quantities of non-conductive, non-oxidizing, absorptive materials.

1,601,470. REFLECTING ELECTRIC LAMP; H. H. Collins, Cincinnati, O. App. filed Sept. 15, 1922. Of the filament type in which light rays which would ordinarily be projected toward the base of the lamp and be spent without any appreciable illuminating effect, will be reflected in such a manner as to obtain the full benefit therefrom.

1,601,475. DRY CELL AND DEPOLARIZER THEREFOR; G. W. Heise, Bayside, N. Y. App. filed June 17, 1924.

1,601,500. METHOD OF ELECTRIC FORMATION OF OXIDES OF NITROGEN; J. S. Island, Merritton, Ont., Can. App. filed Aug. 18, 1924.

1,601,511. PROCESS OF CLEANING ARTICLES; F. C. Schmutz, Matawan, N. J. App. filed April 3, 1923. Cleaning from metallic articles compounds which have been deposited thereon during manufacturing processes or otherwise, particularly in the case of articles consisting of nonferrous metals or alloys which are liable to become discolored or tarnished if subjected to the action of a cleaning agent which is too highly alkaline.

1,601,528. ELECTROPLATING MACHINE; W. F. Hall, Matawan, N. J. App. filed Dec. 2, 1925. Designed to automatically pass articles to be plated into, along, and out of an electroplating bath.

1,601,531. ELECTRIC-MOTOR CASING; H. W. Jeannin, Toledo, O. App. filed May 11, 1925. Motors having gas-proof casing and which are used in dusty, explosive, damp or other deleterious atmosphere.

1,601,606. COMBINATION TEST PANEL AND POLYPHASE METER TRIM; F. J. Waller, Santa Ana, Calif. App. filed April 5, 1923. A unitary structure which shall not only prevent the exposure of conductive elements connected with a meter but which shall also include means to facilitate the testing of meters, and especially polyphase meters, without interruption of service.

1,601,607. LIGHT SENSITIVE ELECTRICAL RESISTANCE DEVICE; S. Wein, New York, N. Y. App. filed Oct. 18, 1924. Photo electric cell.

1,601,642. APPARATUS FOR THE ELECTRODEPOSITION OF METALS ON WIRE OR NARROW STRIP; J. A. Parker, Cwmbran, Wales. App. filed March 19, 1926.

1,601,691, 1,601,692, 1,601,693, 1,601,694. ELECTROLYTIC DEPOSITION OF METALS; M. M. Merritt, Middletown, Mass. App. filed Aug. 20, 1925. Methods and apparatus for making sheet metal by electrodeposition.

1,601,703. PROCESS AND APPARATUS FOR SUPPLYING HEAT TO MOLTEN MATERIAL; C. T. Patterson, Syracuse, N. Y. App. filed March 6, 1925. Electric resistance furnace in which the material to be heated forms the resistance element and particularly furnaces of this type for materials such as metallic salts whose heat capacity and heat conductivity are relatively poor compared with that of metals and metallic substances.

1,601,704. MATERIAL RETAINING DEVICE FOR STORAGE BATTERIES; W. B. Stone, Webster, Mass. App. filed Jan. 20, 1926.

(Issued Oct. 5, 1926)

1,601,726. FUSE; A. L. Eustice, Chicago, Ill. App. filed Feb. 15, 1922.

1,601,743. FLOW METER; J. M. Spitzglass, Chicago, Ill. App. filed Oct. 9, 1919. For measuring the flow of fluids.

1,601,744. THERMOMETER; J. M. Spitzglass, Chicago, Ill. App. filed March 15, 1920. May be used to indicate temperatures at a distance from the point at which the temperature is measured.

1,601,766. AERIAL TRAFFIC CONTROL; L. H. Peter, London, Eng. App. filed March 9, 1920.

1,601,817. TELEPHONE CABLES; J. Forster, Vienna, Austria. App. filed Feb. 3, 1923. A telephone cable comprising in combination a conductor, an insulating cord for said conductor, said insulating cord comprising a central cord of fibrous material and a plurality of cords of fibrous material wound helically around said central cord, said insulating cord being wound helically around said conductor and having its convolutions spaced apart.

1,601,840. SHUNT; D. J. Angus, Indianapolis, Ind. App. filed July 24, 1925. As used for measuring large currents; means for reducing errors.

1,601,834. ELECTRIC DISCONNECTOR; G. C. Oxer and M. M. Samuels, New York, N. Y. App. filed Nov. 6, 1922. Gong-operated disconnecting switch.

1,601,871. ELECTRIC WELDING MACHINE; J. W. Meadowcroft, Philadelphia, Pa. App. filed Nov. 24, 1925. Spot-welding machines.

1,601,902. SEALING-OFF MACHINE; C. Bol, Eindhoven, Netherlands. App. filed Feb. 14, 1924. Apparatus for sealing off a number of parallel glass tubes of bulbs for electric lamps and other vessels to be exhausted, after said bulbs have been exhausted, and provided, if necessary, with a suitable gaseous filling.

1,601,904. ATTACHMENT PLUG; N. C. Butler, Cleveland Heights, Ohio. App. filed Sept. 25, 1919.

1,601,922. POLYPHASE RELAY; J. C. McDonald, New York, N. Y. App. filed March 24, 1924.

1,601,926. FUSE HOLDER; D. E. Simpson, Schenectady, N. Y. App. filed May 28, 1924. Embodying a closed protective casing for the fuse and contact parts.

1,601,927, 1,601,928, 1,601,929. LINE WELDING; H. W. Tobey, Pittsfield, Mass. App. filed Aug. 27, 1923, Nov. 8, 1924, and Aug. 27, 1923. The production of circumferential welds of the type encountered, for example, in welding the head on a drum or tank, or the welding together of sections of such articles.

1,601,934. ROTATABLE ELECTRICAL APPARATUS; A. F. Welch, Fort Wayne, Ind. App. filed Oct. 23, 1922. System for obtaining continuous power using two sources. In combination, a source of current, a motor adapted to be connected thereto, a second source of current, a second motor adapted to be connected to said second source of current, said motors being mechanically connected together, said second motor having a field winding, a commutator and brushes, said brushes being normally out of contact with said commutator, electroresponsive means for bringing them into contact with said commutator, said electroresponsive means and said field winding being connected in series and being energized upon the occurrence of abnormal conditions in said first source.

1,602,039. BATTERY CONNECTOR FOR USE IN CHARGING STORAGE BATTERIES; J. R. Moyer, Scranton, Pa. App. filed Feb. 29, 1924.

1,602,043. ARRANGEMENT FOR CARRYING OFF HEAT; E. Pfiffner, Budapest, Hungary. App. filed May 5, 1924. An arrangement for carrying off heat in an electric device, comprising in combination a casing containing a cast insulating material which has electric and thermal insulating properties, a system of coils arranged in the casing and embedded in said material, and plates having high heat-conducting properties disposed in said material in such manner that the plates are arranged as far as possible in the equipotential surfaces of the electric field.

1,602,065. REPEATER; C. E. Beach, Binghamton, N. Y. App. filed Feb. 28, 1921. For signaling circuits whereby signals initiated on any one of a plurality of circuits will be repeated over other one or more circuits.

1,602,070. SELENIUM CELL WITHOUT INERTIA; G. Dragonetti, Rome, Italy. App. filed Jan. 31, 1924.

1,602,088. CIRCUIT INTERRUPTER; M. H. Shoenberg and L. Schon, San Francisco, Cal. App. filed Nov. 22, 1924. Thermally actuated means for making and breaking the circuit periodically; actuated by the heat generated by the flowing current during the period of circuit conductivity.

1,602,100. ELECTRIC ARC LAMP; T. L. Carbone (deceased), late of Berlin, Germany. App. filed Nov. 25, 1922.

1,602,221. ELECTRIC CONNECTOR; C. E. Godley, Detroit, Mich. App. filed March 26, 1925. Used on low-voltage circuits, as on automobiles, etc.

1,602,225. ELECTRIC HEATER; J. J. Gough, Chicago, Ill. App. filed Nov. 12, 1925. Bowl-type heater.

1,602,227. FUSE HOLDER; C. T. Hentschel, Schenectady, N. Y. App. filed July 9, 1924. Embodying a closed protective casing for the fuse and contact parts such that the fuse may be easily and quickly inserted and removed.

1,602,238. MERCURY-VAPOR APPARATUS; K. Mensing, Hanau-on-the-Main, Germany. Quartz lamp for operation by alternating current.

1,602,245. MERCURY-VAPOR LAMP; J. Nisbit, Glasgow, Scotland. App. filed Sept. 21, 1925. Used for projecting pictures.

1,602,297. ILLUMINATING MEANS FOR TOY RAILWAY CARS; H. S. Becker, Chicago, Ill. App. filed Feb. 16, 1926.

1,602,300. AUTOMATIC SIGNAL; J. H. Grant, West Haven, Conn. App. filed Oct. 12, 1923. For use in connection with refrigerators to give an automatic signal when the drip pan of the refrigerator is about to overflow.

1,602,318. ELECTRIC SWITCH; C. E. Anderson, Stratford, Conn. App. filed July 15, 1924. Switch of the key-operated type using a toggle switch mechanism.

1,602,370. ELECTRICAL RECEPTACLE; C. H. Avery, East Orange, N. J. App. filed Dec. 6, 1922. For attachment plugs of the spaced blade type.

(Issued Oct. 12, 1926)

16,438 (reissue). BATTERY CHARGER; E. W. Engle, Lake Forest, Ill. App. filed Aug. 19, 1922. Adapted to be used to charge storage batteries from a source of alternating current.

1,602,402. BATTERY; O. S. Flath, Chicago, Ill. App. filed Feb. 16, 1922. Primary batteries employing cylindrical or tubular forms of positive and negative elements; means whereby the positive and negative elements may be insulatedly secured together in proper spaced relation to constitute a unit adapted to be supported or suspended by a single element from the cover of the jar or vessel which contains the electrolyte or caustic soda and oil solution.

1,602,444. FLUID METER; J. M. Naiman, Chicago, Ill. App. filed June 16, 1919.

1,602,502. FLUID-STAGE-ACTUATED CIRCUIT CLOSER; J. D. Pirtle, Chicago, Ill. Indicator to be applied to a tank or container of fluid preferably embodied in form for indicating at a distant point the stage or surface level of the fluid; has for its object the provision of means whereby the several stages to be indicated will be impressed upon the attention of the observer by an independent signal unit for each stage.